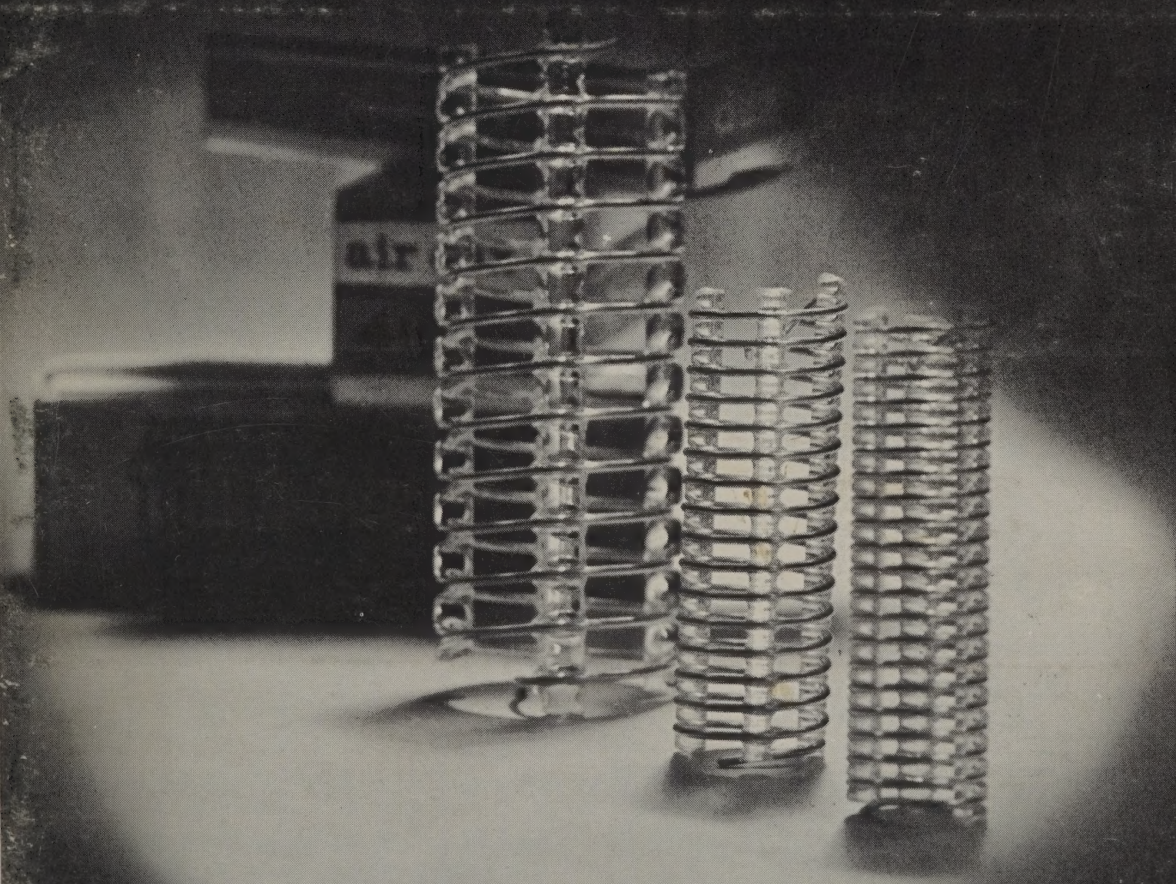
VHF HORIZONS

DECEMBER 1962
40 CENTS



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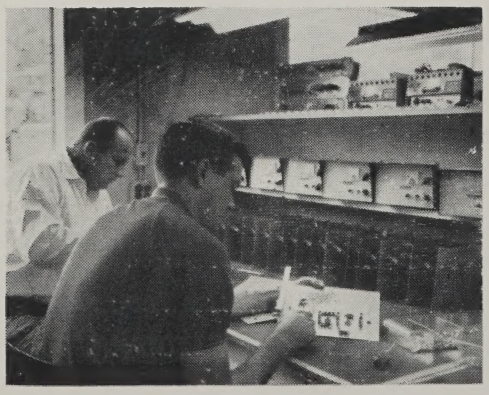

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are YOU doing YOUR part?

Hams as a rule are a pretty ingenious sort. Enterprising too. A large number of the hams we have met are in business for themselves, or they work closely with someone who is. It seems that the hams who aren't in business for themselves are usually pretty close to the electronics industry.

So what?

So this. VHF Horizons is, admittedly, one of a family of publications from Horizons. BUT—it **is** different from the other Horizons' books (in the publishing 'world' we call magazines books. No-one seems to know why. It just happened that way). VHF was doomed to lose money from the start.

So why?

So here. There are already three successful amateur radio magazines. We have approximately 150,000 active USA amateurs. About 1/3rd of these operate VHF-UHF bands. Seemingly we should have all of these 150,000 VHF-UHF minded hams reading VHF. **Seemingly.** How many do we have reading VHF this month? Well, we are printing 19,000 magazines this month. Over 12,000 of these are paid for. The other 7,000 go out to VHF'ers who haven't fallen to our massive subscription campaign yet. We mail to approximately 7,000 such unfortunates every month. Not the same 7,000 however. Different ones.

So why-when and what?

So here. We here at Horizons have no intention of making any money with VHF. (Our stock holders are probably shaking in their boots about now—but then that's their problem for ever getting hooked up with us to start with!) We have one desire. To provide the amateur radio fraternity with a magazine aimed at the future of amateur radio. **VHF and UHF.** If we can do this and break even, everyone will be happy. (except a few stockholders—but then they **never will** understand us.) To break even, and make up a subscription list big enough to attract advertising in **quantity,** we need a minimum of 2,000 **new** subscribers every month. 24,000 a year.

Here's how you can assure that we at least break even, and keep the stockholders off our back (they surely can get in the way when you are trying to put out a first class mazagine!). Go out today and find **two** VHF'ers who **don't** subscribe. Really put the pressure on. Make them see what a terrible mistake they are making by not subscribing. Mention the five issues prior to this one which contained a total of 200 pages of highly interesting reading material just about VHF-UHF. Tell them about the news while it is **still** news, and the construction articles and new approaches to operating that you read about every month.

Just **two** VHF-UHF'ers. From each of you. That isn't asking so much now . . is it?

Subscription Cards on reverse side—tnx

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My eyes have seen the light. How will I ever get along without the first five issues. Oh pain and agony. Here—enter my subscription as checked off below. **My check or money order for $4. is attached hereon.**

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_____ **Git my 14 copys.** My male man don't come bye butt ever forteen days. So I cudn't giv this to um B4 Deicember 6.

_____ **Ok U sneeks.** Im late and no it. Putt ma hide duwn fer 13 of yer rags cause I ain't mail this til aftir Deicember 6.

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(1) Fill out the area below with the name and address of the ham you want to give VHF to as a Christmas present.
(2) Add your name and/or call where indicated.
(3) VHF will enter a Christmas Gift subscription for 12 months, **and,** send a gift card to your lucky recipient noting that you donated the gift.
(4) OH YES—enclose a check or money order for $4.00!

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From the Publisher's Shack

SURPRISING RESPONSE

Our past October issue (Special on Antennas) made us sit up and take notice for a number of reasons. Not the least of which was the reaction of readers to a small obscure red tear out card titled "D.R.P." for Direct Reader Participation.

The idea behind the card was this. We provided a handy mail-in card for VHF/UHF'ers to list the DX of the past month, describe new construction projects underway or completed, list a few of the new calls heard on the air locally, and even tell us which articles they like the best in that particular issue.

We expected perhaps 100 cards to return. Several times that number came back.

The D.R.P. program was set up as a test for one month only—October. In the future it will be included in every month's issue of VHF. And we hope that those several hundred fellows who took the time to fill it in and return it to us will do so every month. What's more we hope that new readers as well as our "old" readers who did not return the card the first month will make it some sort of regular habit in the future.

Let's see what happens to that card when it hits our office. First of all I read it over myself. I keep a running tally on articles liked and dis-liked, and I carefully note the line "We are searching for information on . . ." because this tells me what areas of editorial coverage we need to dig up material for.

Next the cards go to Jim Kyle's nook in our office where he digests the data in a similar fashion (no two of us see a project the same way as a rule, so this gives us divergent viewpoints and areas for discussion). Jim especially digs into the line "Articles we enjoyed in October issue . . ." because this tells him how he should plan future issues.

Last of all Associate Editor Russ Miller pores over the cards checking off the projects listed on the line reading "This month we built the following . . .". Russ has a file-drawer mind and six months from now he can be relied upon to tell us how many of you built the 102 converter, 16 element colinear, 4x250B final, etc., right from memory.

Then the card lands in the *Vital Happenings and Facts* folder from which one or more of us prepare the DX and Operating news column for the following month.

But it's not all over here. Next the card heads for the circulation department where one of the girls pores over the line "New stations heard on locally . . .". Each call listed is checked against a growing file of VHF/UHF operators we keep up to date daily. If the call is a new one, we add it to the file on a 3 by 5 card, look up the name and address in the latest Callbook, and type up a mailing sticker for that new VHF/UHF ham. The sticker is used to send the newcomer a sample copy of VHF Horizons the following month.

Last of all, the card which you were so thoughtful to return to us heads for a filing room where they are kept for reference

Now, perhaps, you see how valuable these "DRP" cards are to us. Or, how valuable they would be to any publication.

This month's magazine *doesn't* contain a DRP card. The subscription card was made up in early October some weeks before the results of the first DRP test run could be compiled. Next month's magazine (January —out December 15th) will signal the return of the DRP program. We hope you will think enough of VHF to return it to us promptly. Obviously, it can mean a great deal to the future of our hobby.

W5KHT

VOLUME 1 — NUMBER 6

DECEMBER, 1962

VHF HORIZONS

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OUR COVER

Pi-nets involve coils, and we have a staff report this month on pi-net design. That's why we turned chief photographer Cliff King loose with a handful of coil stock and told him to have fun. The result was the cover. The staff report is on page 19.

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SCATTER

. . . de K5JKX

ABOUT A BIRTHDAY PRESENT

With this issue, VHF Horizons is six months old.

In some ways, it doesn't seem we can have been around that long. In others, its amazing to us that the time has been so short.

For instance, if you go back through this and the five preceding issues, chances are you'll find at least six earth-shaking (to you, at least) articles. We plan the magazine this way. Naturally, not all of you will agree on just which six articles are concerned . . . and probably few of you will agree with us on it!

Since this is the standard we work to and intend to maintain, back issues are at a premium. Unlike other magazines we could name but won't, we do not have a large file of our early issues remaining. They're gone!

This situation bids fair to continue indefinitely, so we have come up with a plan.

Other magazines publish "giant" annual issues, and at least one has published an "anthology" of its early material. These approaches are good, and we don't quibble with them.

But we feel it would be far better to publish a special annual volume of "The Best in VHF." What better time to release this volume upon an unsuspecting world than our birthday?

So unless you deluge us with mail screaming "Halt and desist!", you can expect the first of these volumes to be issued on July 15, 1963. It will probably include from 60 to 80 pages of the best material from our first 12 issues, and we hope to sell it for a buck.

Selecting just what material to include is going to be a problem, though, since many of you probably disagree with us about what the best item in each issue is. That's where you come in, and why this item is being written. We want your votes for the article *you* think best in each issue.

We're not asking for orders for the book now (in fact, we can't even accept any yet, since the price isn't firm). But we *are* asking that you take time to jot down on a postcard the titles of the articles you feel should be included in this volume.

You can already vote for your choices for the first six issues. Vote for one or a dozen from each issue; there's no limit. We *do* want an accurate idea of what all of you think have been our best so far.

In the next six issues, and thereafter, the question on our DRP card about what articles you liked best will count as your vote for that issue. This way, we'll be sure that "The Best" is *really* composed of our best from the first year—and the second year's "Best" should be even better!

MORE ABOUT CLASS-CONSCIOUSNESS

For quite some time now, we've been beating the drum rather loudly about the class-consciousness which infests the VHF region: some people hate Technicians, some Technicians hate anyone who *isn't* a Tech, and a few VHF'ers (apparently) just hate everybody!

Now if you just stop to think about it, a situation such as this is all wrong. At Portland, an FCC attorney felt called upon to go out of his way to warn all hams (not just the VHF crew) that they were spending too much time bickering about little things and not enough time acting in the public interest, and that if things didn't change, hams might suddenly find themselves short a few frequencies!

All of this is by way of leading up to a situation just called to our attention. From this viewpoint, it appears that class-consciousness has reached an extreme in this case.

Triggering the situation was an editorial which appeared in the "Virginia Ham News". Placed on page 7, and headed "Items of Interest, (An Editorial) by the SCM, it first quoted paragraph 3 of the FCC memorandum opinion and order denying Tech is privileges on 10 meters. Portions of the paragraph were underlined.

Then the editorial continued with "one further word in respect to the Technician class licensee." While we don't have room to quote the whole thing here, a couple of lines

(Turn to page 30)

One Gallon of Suds...

Russ Miller, W5HCX
Associate Editor, VHF

Whenever the subject of linears is brought up in casual conversation, the comments are usually confined to their inefficiency. True, for the amount of plate power input to a particular amplifier versus its measured output, the linear can be classed as inefficient in AM-only service.

Why use a linear for AM equipment then? First, the modulator with its transformers and heavy power supply can be eliminated. Oh, you'll sacrifice output all right—but correspondingly the linear will require much less drive. This means that the exciter can be made quite small and by the same token so can the linear. Here is the basis for a true table-top kilowatt.

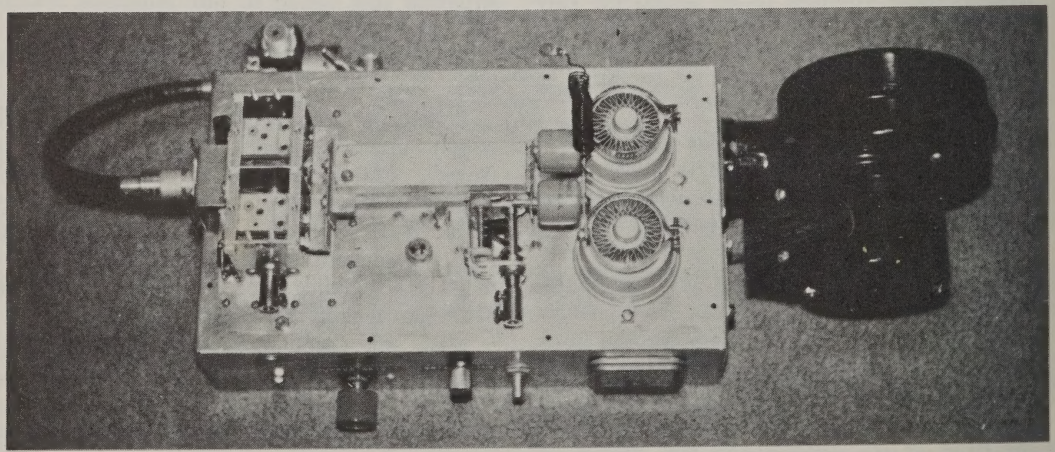
When space is a consideration, this approach to equipment layout is most practical. For emergency purposes the rig can be picked up and taken to wherever the need is for communications. Field day exercises and VHF contests can be participated in with really portable equipment.

What about SSB? The linear is a must for the VHF SSB'er. Whether the linear is used now or later for this purpose, it is wholly adaptable without major (or in fact without any) modification.

Linears, when used properly, can result in a mighty big signal. A lot of the manufacturers can attest to the workability of them as well as the many, many hams that have bought them. In fact, the idea for the linear described in this article was based on one very popular unit, the Johnson, 6 and 2 Thunderbolt.

Since operation of the linear was to be confined entirely to 2 meters, it was felt that the overall size of the unit could be reduced to something around 12" x 6". A real hasty layout proved that this assumption was correct. The plate tank did worry us a little bit, mainly because of size. Using the same system that a lot of people have been going to, namely the Pi Net, seemed to be the best idea from the physical standpoint. This is the type of tank circuit that was finally adopted and proved to be the easiest network to tune that we have had the pleasure to expeiment with.

The next problem was the selection of appropriate tubes for the job. Here again the physical size of the tubes was a major con-



Top view of amplifier with 12" x 7" x 3" top cover removed. Dual 100pf. loading capacitor occupies left-hand end of chassis. Shaft couplers on the PA tuning and loading capacitor are necessary for easy removal of cover. Choke adjacent to the 4CX250B's attaches to Hi-voltage jack on back of top cover.

. . . for Two

sideration. Developing power at any of the higher VHF frequencies almost always leads to thoughts of big tubes and cost. Frankly, cost is one item that can't be gotten around. The overall cost of tubes can be lowered by using the surplus versions. About the easiest high power tube to find for a reasonable price is the 4X150A or 4X250B. Which one should be used is up to the builder and his desires.

Sockets for the 4X series are something else. They are not too expensive but on the other hand not so cheap. The advantage of the sockets is found in their ability to be re-used. This is, in part, due to the very few solder connections necessary to get the tubes working. Also the sockets will accommodate either the 4X150 or 4X250 tubes.

For this particular 2 meter linear, the 4CX250B was chosen for the job. One of the outstanding reasons was the physical strength of the tubes. Don't drop them on the floor though, just to find out how rugged they are. The tube also offered sufficient dissipation to lower the possibility of damage due to failue of some particuar component in the linear.

CONSTRUCTION

The entire linear is built on a 12" x 7" x 3" aluminum chassis. An identical chassis is then used for the top cover. In mounting the parts, only two things are particularly critical. One is the mounting of the tube sockets and the other is the grid by-pass capacitor.

In mounting the tube sockets, care in getting them as close together and as far away from the end of the chassis as possible, is an absolute must. The best method is to plug the tubes in the sockets and visually lay them out on the chassis keeping *at least* 1" from the edges of the chassis.

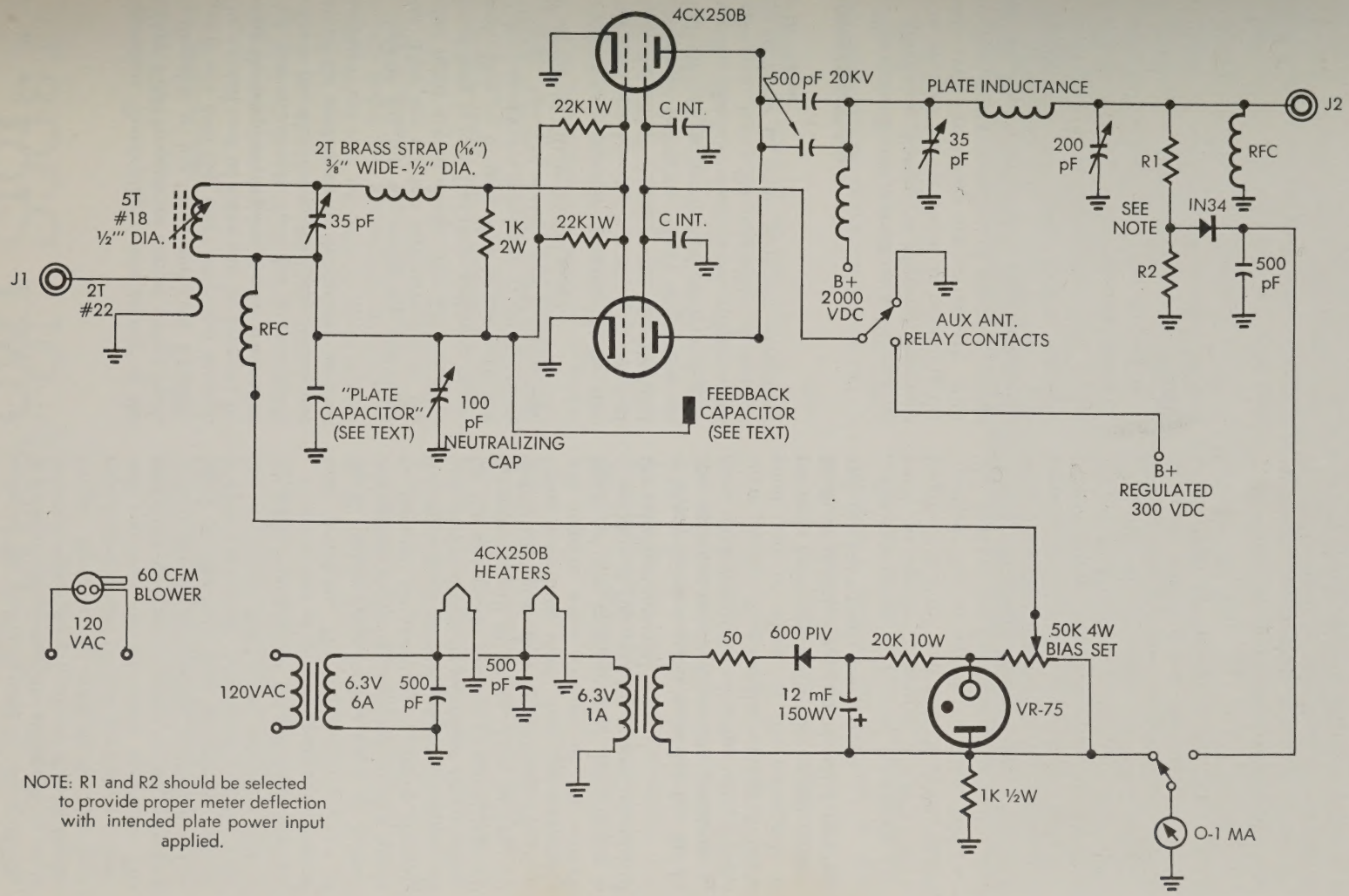
The grid by-pass capacitor and grid tank is similiar to the one used in the Thunderbolt and functions very efficiently. The capacitor is made of 1/16" brass and is 2½"x3". This plate is centered on the underside of the chassis with the edge closest to the tubes, 3/8" from the edge of the tube sockets. The dielectric used for the capacitor is critical. Obtaining the dielectric is easy, however: just get a quart of Carnation Ice Cream. Remove the contents by the most expeditious means (if you are not on a diet) and you have the necessary materials. The particular ice cream carton we are referring to is of the plastic variety most easily identified by the fact that the plastic is very pliable when cold. Carnation's is the only one we found that would stand up and at the same time gave us the required capacity.

Construction of the plate tank may present some problems. The inductance portion of the Pi Net is made from a piece of X-band waveguide, available from the surplus market. This was the best way to obtain, cheaply, the necessary materials for the inductance. If you should desire to substitute brass tubing for the waveguide, be sure to use at least 60 thousandth wall thickness. Thin tubing will distort with heat, thereby detuning the final. Using something other than the waveguide will require some change of the overall length of the inductance. A grid-dipper is a necessity in this case for proper pruning of the substitute material.

Using the waveguide material for the Pi Net inductance will solve two problems at once. One is rigidity and the other is the silver plating. Most surplus waveguide has a good coat of silver. If the waveguide is painted, most generally the metal underneath is plated. Use a good paint remover and you have ready made stock.

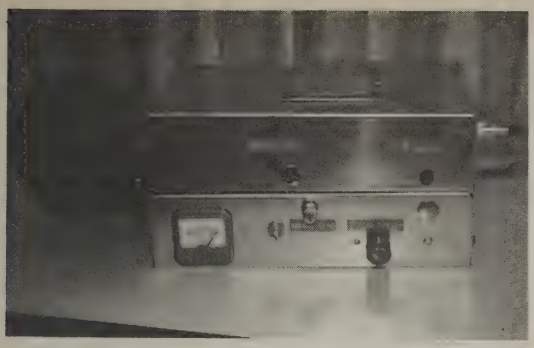
Cut two pieces of X-band waveguide (X-band waveguide measures 1"x½") to a length of 4 3/16" and bolt these two pieces together, one on top of the other. Make an "L" bracket for the loading capacitor end of the inductance from brass or copper stock. The "L" bracket should not be too large or it will add to the overall inductance present in the plate tank. Attaching the "L" bracket to the loading capacitor may be a little difficult depending on what type of loading capacitor you use. If a split stator capacitor is used, a brass bar can be soldered across both sections and the "L" bracket bolted to the bar.

Attaching the inductance to the blocking capacitors can be done in the same manner as with the loading capacitor end. The plate connections to the 4CX250B's are made from common stainless steel hose clamps which will more than stand the heat without distor-



NOTE: R1 and R2 should be selected to provide proper meter deflection with intended plate power input applied.

6 For the best of VHF—subscribe today!



Front panel view of linear. Controls along bottom edge of chassis are: output-grid current metering switch; grid tuning; neutralization. Controls on top cover are: loading; PA plate. Square plate on top of amplifier is air exhaust and is made of brass screen and brass strip.

ion and are good and flexible. The clamps are joined with a 1/2" brass strap which in turn is anchored to the blocking capacitors. A small hole should be drilled in the middle of this strap to allow for connection of the RF choke.

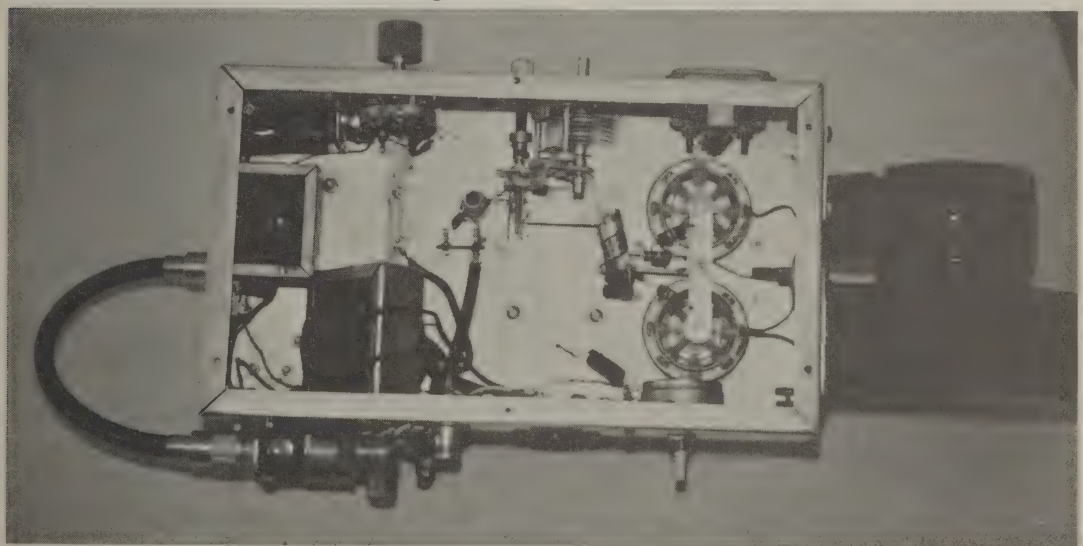
The plate tuning capacitor that is selected for the job should have at least double spacing to prevent arc-overs. It should also be mounted firmly to the chassis. The stator connection on the capacitor is soldered directly to the plate inductance at a point about 5/8" from the blocking capacitor end.

An RF voltmeter is included as an aid in tuning up the final. This is the only metering used, besides the grid current metering, but some builders may want to include plate and screen current meters. Plate and screen current meters can be overlooked, though, since the RF voltmeter will tell you whether or not the final is functioning. Once the idling plate current is set at the recommended value by adjustment of the bias pot there is little that will change it. If the final is overdriven, the grid current will show that the exciter output needs to be reduced. The only thing that will materially affect the plate and screen currents is the adjustment of the loading capacitor. However, once this is set, it need be touched up only very slightly when changing frequencies in the 2 meter band. So, the best overall indication of proper operation is the grid current metering and RF voltmeter.

Neutralization of the linear is done in the same manner as any other amplifier. The neutralization system may look different but it isn't. It just uses a more adaptable means as far as the VHF frequencies are concerned. Feedback for neutralizing the final is gotten from a small, 3/4" long, post located in the center of the chassis directly under the blocking capacitors. The bottom of this post is connected to the grid by-pass capacitor plate underneath the chassis. A nylon tip jack and plug seems to work well for this purpose.

Mounting the neutralizing capacitor (140 pF variable) is somewhat of a problem. It must be connected to the by-pass capacitor plate as directly as possible. Since the grid tuning capacitor in the linear was mounted to the by-pass plate on an "L" bracket, the neutralizing capacitor was mounted on the

(Turn to page 28)



Grid by-pass plate is mounted directly to the left of the tube sockets. Two of the retaining screws are visible the other two are hidden by the 2 1/2 turn grid coil and the grid tuning capacitor. The large transformer in the photo is for the heaters and the small transformer for the bias supply.

more about...

FM versus SSB

Well, we sure stirred one up this time. Back in October, in the "Scatter" column, we casually mentiond that with "proper" receiving techniques FM has "the same advantages over SSB that SSB has over AM" —and the mail poured in!

Nobody, but nobody, agreed with the statement. A couple of people challenged us to prove it by demonstrating long-haul FM circuits in use and outperforming SSB. Others simply referred us to the existing (and rather sparse) engineering reports on the subject.

But one of our research consultants, W6-FZA, went all the way. For those who may not know, Alan makes his living in the commercial two-way field, where everything is FM. "I have literally eaten and slept with FM gear" for 14 years, Alan wrote. "FM is a great, useful workhorse, but it is *no miracle.*"

And since he felt that our offhand comment must have *some* basis (and also since he is a true experimenter), Alan ran a series of comparison tests.

His detailed reports of these tests, together with his conclusions, appears at the end of this article.

Getting somebody interested enough to do just this was admittedly one of the reasons for the statement in the first place—but we'll stick with the declaration, adding only one qualification. FM outperforms SSB *up to a definite point.* Beyond that point, the odds reverse and things go the other way.

And while Alen's report is extensive and is appreciated, one thing must be kept in mind while evaluating it: the technique of comparing FM to CW, CW to AM, AM to SSB, and thus inferring the comparison of FM to SSB, introduces an awfully lot of room for error—especially when the outcome is in the region of 2-db figures. Heavens—we haven't yet been able to agree whether SSB has a 6, 9, or 24-db advantage over AM!

Among those who referred us to the engineering reports was K4KVF, who advised us to check an article in the Proceedings of the I. R. E., December, 1956, titled "Comparison of SSB and FM for VHF Mobile Service", and also the Collins Radio publication "Fundamentals of Single Side Band."

It might surprise everyone to know that the Collins publication—which is quoting the I. R. E. report — furnished the figures on which the original statement was based!

The report compares NBFM and SSB, and to quote K4KVF (who boiled it down most accurately) "the heart of the report is that with signals below the threshold of limiting SSB has a distinct and increasing advantage over FM while above the limiting point FM has a distinct advantage."

With which we agree wholeheartedly!

The kicker in the situation is the location of that crossover point, the "threshold of limiting".

A graph in the Collins publication shows the threshold to be located at approximately 167 db path loss. In other words, so long as your path loss is less than 167 db, FM has the advantage. When path loss becomes 168 db or greater, SSB takes the helm.

So how much loss is 167 db, in terms of miles (under average coditions)? At 50 Mc, about 110 miles. This doesn't sound so good.

However, this is just the starting point. The curve in the Collins book fails to mention a few important factors which can cause wide variations in the distance. Some of these considerations include little things like transmitter output power, antenna gain, receiver sensitivity, etc!!!

To pin it all down to some *meaningful* sets of figures, we went to a Howard Sams book, "Scatter Propagation, Theory and Practice" by Ira Kamen and George Doundoulakis. There, on page 26, we found a similar chart which compares FM and SSB—but this one included the pertinent data (incidentally, it also originated with Collins Radio, in a design system report quoted at length in the Sams book).

From the data in the two charts, our chart (Figure 1) was drawn. Before you read any answers from our chart, though, do a little thinking.

Our chart is drawn for a transmitter *output* power of 1 watt, and antenna gain of 0 db Isotropic. This was done to make it universally applicable if anyone else wants to apply this data. Note that the crossover point has now moved to 162 db; this would indicate that the figure we were using before applied to a low-power mobile system with only about 2 watts output. Now 110 miles range with 2 watts out into a dipole antenna sounds a little better, doesn't it!

Let's run through another sample calculation, using Figure 1 and a set of conditions more like what you'll find in a DXer's shack:

Assume a full kilowatt on 50 Mc, and let's give him credit for medium efficency and call it 600 watts power output (for the SSB case, this would be 600 watts PEP output). Let's also allow 10-db antennas at each end of the circuit although many DXers run bigger arrays than this. Finally, let's figure the receiver sensitivity in db so it can be put into the calculations too. A *good* receiver at 50 Mc (0.07 microvolt sensitivity with 3-db S—N/N ratio) has a db sensitivity of —160 dbw.

Since our chart is based on transmitter power of 1 watt (which is 0 db above 1 watt or 0 dbw) and 0-db antenna gain, let's add in some db to account for the higher power and actual gain present.

600 watts power output is 6 times 100 times as great as 1, or about 7 db plus 20 db. That's 27 dbw for the transmitter. 10 db of antennas at each end adds another 20 db. And the receiver sensitivity of —160 dbw adds another 160 db. Total gain to be added then is 207 db.

By standard propagation calculations, with this equipment on AM you could stand a path loss of that same 207 db for a 3-db S—N/N ratio (with no safety factor for fading) or 200 db for a 10-db S—N/N ratio.

Receiver gains are included in Figure 1, so we only add the 47 db for transmitter and antennas to get the allowable path loss in the FM and SSB cases.

For a 10-db S—N/N ratio (which *is* the crossover point), we now can stand 162 plus 47 or 209 db path loss. This is a clear 9-db advantage over AM.

At 209 db path loss, FM and SSB are equal in performance. Now let's look a little farther. If we trim just 2 db off the path loss, to 207 db, FM jumps to a 10-db advantage over SSB! (Actual figures read from the enlarged original of Figure 1 are S—N/N of 26 db for FM and 15 db for SSB. AM ratio for the same case would be 12 db.)

Admittedly, if the path loss goes that same 2 db in the other direction, to 211 db, then SSB comes up far superior to either of the other modes. But what distance gives us a 209-db loss?

From figures in the Scatter book from Sams, a 209-db path loss (average) at 50 Mc is approximately 450 miles.

This would mean that, if you're running a good KW and at least 5 elements of antenna, you should be able to expect at least 10 db of advantage by using FM over SSB, *within a 450-mile radius.* Beyond that distance, SSB will show some advantage—and the drop-off in FM strength will be rapid.

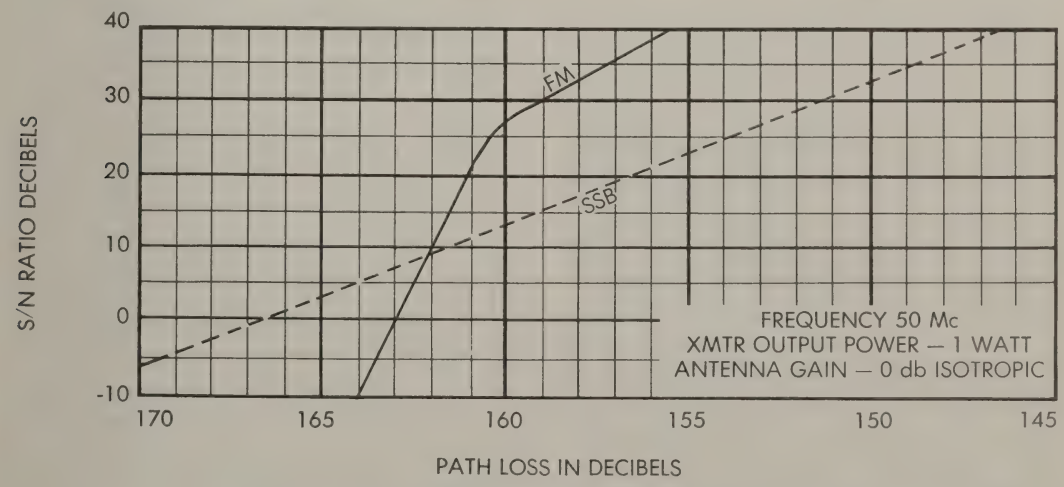


Figure 1. Comparison of FM and SSB signal-noise ratios.

All this is based on 50 Mc What about higher frequencies?

No reliable data is available. *If*—and it's a big if—the path loss relationship is similar, then you should be able to expect about 300 miles range on 144 Mc with 600 watts output and 10-db antennas at each end. However, so far as we can determine no one has tried it.

Final note—while all the Collins reports which furnished this data concluded that SSB outperforms FM hands down at the limits of range, the commercial tropo-scatter circuits (which *must* have top reliability) all use FM!

This is one side of the story. For the other side, backed up by experiments (see the earlier note before drawing conclusions), here's Alan:

FM vs. SSB vs. CW

Object of Test: To determine the capabilities of a well-designed FM receiver in receiving CW. This information, properly interpreted, could lead to the evaluation of the weak-signal properties of FM as compared to SW, and SSB.

Equipment:

1 Motorola TA 140 receiver, designed for plus or minus 5 Kc modulation acceptance (approximately 10 Kc B.W.). This receiver tested and adjusted to meet factory specs.
1 Measurements 80D calibrated generator.
1 Hickock low frequency generator
1 RCA Voltohmyst
1 Motorola Base Station, FM

Test I

The reciver under test was energized and connected to an outdoor antenna, three miles from the base station. The receiver was then desensitized at signal frequency (front end) until the base station was barely readable. At this point the base station, with its matched audio response for maximum intelligibility, was barely readable when modulated 5 Kc with only slight audio limiting, more readable when modulated to heavy limiting, and became completely unreadable on syllables modulating less than 4 Kc.

With the receiver desensitized as above, the base station produced approximately 3 db quieting when keyed without modulation. This entire test was repeated three times and the unmodulated quieting for the signal which was barely readable when properly modulated was respectively 60 percent, 65 percent and 70 percent in voltage. Since 70 percent is 3 db, that figure was taken for convenience.

The conclusion from Test I is that, *for this particular receiver*, the minimum usable FM signal corresponds to 3 db quieting.

Test II

The receiver was resensitized, and the 80D was connected to the input, providing a calibrated signal. The Hickock was coupled to the 455 Kc *IF* to provide a BFO, and was adjusted for an 800 cycle beat.

It was found that for every value of signal frequency, a good beat note could be obtained by carefully adjusting the amount of injection. In spite of the 10 Kc bandwidth and the FM detection arrangement, it was possible to receive a beat note down below the point where the 80D calibration was accurate. The front end of the receiver was then carefully desensitized to a point where 1 microvolt of signal was just readable as a CW beatnote. The BFO was then removed and the signal increased with nothing else changed, until 3 db quieting was achieved (corresponding to minimum readable FM signal). Three complete tests yielded 5 uv., 5 uv., and 6 uv, for this condition. 5 uv. was taken as the safe figure.

The conclusion from Test II is that it takes 5 times as much voltage for 3 db quieting as it does to produce a minimum readable CW signal with *no change in bandwidth*. This corresponds to 14 db.

Conclusions

Since the well-designed FM receiver under test required a signal corresponding to 3 db quieting to be barely readable when properly modulated, and a signal 14 db weaker than 3 db quieting could be made readable on CW with the addition of a BRO, we can conclude that this receiver is 14 db better at receiving CW than FM. This is with the original 10 Kc bandwidth, and still using the FM detector! (Possibly detection was taking place in the first limiter). This 14 db advantage is conservative — if the base station had not been limiting slightly, and if the 6 uv. figure had been used, if the 60 percent quieting figure had been used, if proper CW detection had been used, the advantage of CW could have been 16 or 17 db.

Of the various ways of comparing AM to SSB, the most conservative gives SSB a 4.8 db advantage. For an AM station to have 100 watts of RF in the air, it has 66 watts

(Turn to page 37)

Moonbounce

Pioneering takes many forms in VHF-UHF work. Generally speaking, it is the attempt to accomplish some feat not previously completed.

Two 144 megacycle enthusiasts, Ned, K1HMU, and Bill W6DNG, of Farmington, Connecticut, and Long Beach, California, respectively, have been engaged in experimental moon bounce work on the two meter band for two summers now.

Moon bounce on two meters is not new. W4AO and others prc ed it could be done by copying their own echoes years ago. But the moonbounce fever on two meters rapidly dissipated when 1296 Mc enthusiasts calcullated that considerably superior signal-to-noise ratios were to be had in the lower microwave region. Recently Sam Harris, W1FZJ, operating W1BU, worked KH6UK over a 5,000 mile plus 1296 Mc path via moon bounce.

The fact still remains that "low frequency" moonbounce of continent spanning proportions has yet to be done. And, to the average VHF minded amateur, 700 watts of RF output on 144 megacycles is still a whole lot easier to master than a similar amount at 1296 megacycles.

But, the signal to signal ratio for a given RF output and antenna gain between 144 megacycles and 1296 megacycles is on the order of 10 db. In other words, it requires at least 10 db more circuit gain on 144 than it does on 1296 to make moonbounce work. For the most part the additional power required can be traced to atmospheric and ionospheric absorption of the 144 signal, whereas the 1296 signal finds little barrier in the atmosphere or ionosphere.

The K1HMU-W6DNG tests began on August 24 and continued through September 15. Schedules were maintained every day except August 27 — September 2, September 5, 9 and 10. Signals were heard on a two-way basis on every schedule day except August 26, and September 14-15.

On three days, September 3, 11 and 12, both stations came painfully close to completing a contact.

The only *really* exotic piece of gear at both ends of this circuit are the antennas. Exceedingly low noise converters and full input-high efficiency transmitters at both stations play for every last fraction of a db. The unusual antenna at K1HMU is a 'small' set of 16 long yagis (32 foot booms), arranged in a box array that includes ala WϕBBM (see October issue of VHF) cross mounting of antenna elements for either vertical or horizontal polarization, or circular polarization in either direction.

The antenna at W6DNG consists of two 42-element (84 elements in all) turnstile antennas, *i.e.* with the same selectable polarization as the K1HMU antennas possess. 6DNG's antennas are 28 feet long, spaced 20 feet apart. The antenna gain at K1HMU is unknown, although the calculated gain at W6DNG is around 23 db.

Schedules were maintained using fairly standard meteor scatter techniques, including the adopting of meteor shower codes for exchanging information. For example, on September 3, K1HMU heard the W6DNG signal up to 10 db above the noise, and sent a S4 report. W6DNG replied with a S3 and RS4 (roger-S4).

The size of the K1HMU antenna array may in itself have been a limiting factor on the trans-continental moon bounce schedule. Ned notes "The monster antenna . . . was not putting out true circular polarization. This was evidenced by checking the signal with a series of neon bulb tests along the directors. This was due, no doubt, to the mass of phasing line required, and the particular system used to phase the two turnstile yagis 1/4 wave apart. Improvements are planned, needless to say."

One of the most baffling bits of evidence to come from the recent series of tests concerned that old bug-a-boo, polarization skew due to faraday rotation in the ionosphere. Some may remember a series of letters in

CQ's old VHF department in which Ned, K1HMU,and other interested parties batted back and forth the question of what happens to a right hand circular polarized wave when it (a) passes through the ionosphere on the way to the moon, (b) rebounds from the moon's surface, and (c) re-enters the ionosphere on its way back to earth.

The question was resolved by the adoption of a standard definition, *i.e.* "A left hand (counter - clockwise) polarized wave seen from the transmitter is a right hand (clockwise) polarized wave as seen from the receiver."

Working with signal levels that require 500 cycle filters to determine signal to noise ratios of the order of 2—5 db, cross-polarized reception is a theoretical impossibility. However, during the tests W6DNG was receiving his own echo from the moon *without* switching from right hand to left hand circular. Ned reports "This is theoretically impossible. If W6DNG transmits a right hand circular signal it will become a left hand circular upon its return, and the antenna should be switched for left hand circular to receive one's own echoes. I don't have an answer to this one either."

Another interesting by-product of the moon bounce tests was indication that signal levels were generally higher at the start of schedules than as schedules went on. September 11 the schedule time was painfully close to the time the moon was due to set over the horizon at K1HMU. On that date W6DNG heard K1HMU warming up before the test. Bill sent an S3, and copied an RS4 come back from Ned. Bill then sent RR SK. Ned never heard the closing formalities because the moon set at the time for K1HMU!

Or, take September 12. Ned heard the W6-DNG signal "clearly in the 500 cycle filter" sending S3. Ned replied with S4. Bill heard the S4 and returned with a RS4. At that moment line noise broke out at K1HMU. Both stations reported signals weak but steady that evening.

PROGRESS

With success so near Ned and Bill are looking forward to the Christmas vacation period when Ned will again be available to maintain schedules. Meanwhile, KL7AVD has advised he is set up for operation and CT3AE says he is ready to go except for a long overdue 4X150 which hasn't arrived from the states. Jose (CT3AE) has 104 elements on 4 — 24 foot booms.

W6DNG is available for schedules with anyone suitably equipped for 144 megacycle moon bounce work.

A 6-Meter Peanut Whistle

Larry Levy WA2INM/1
Marlboro College
Marlboro, Vervont

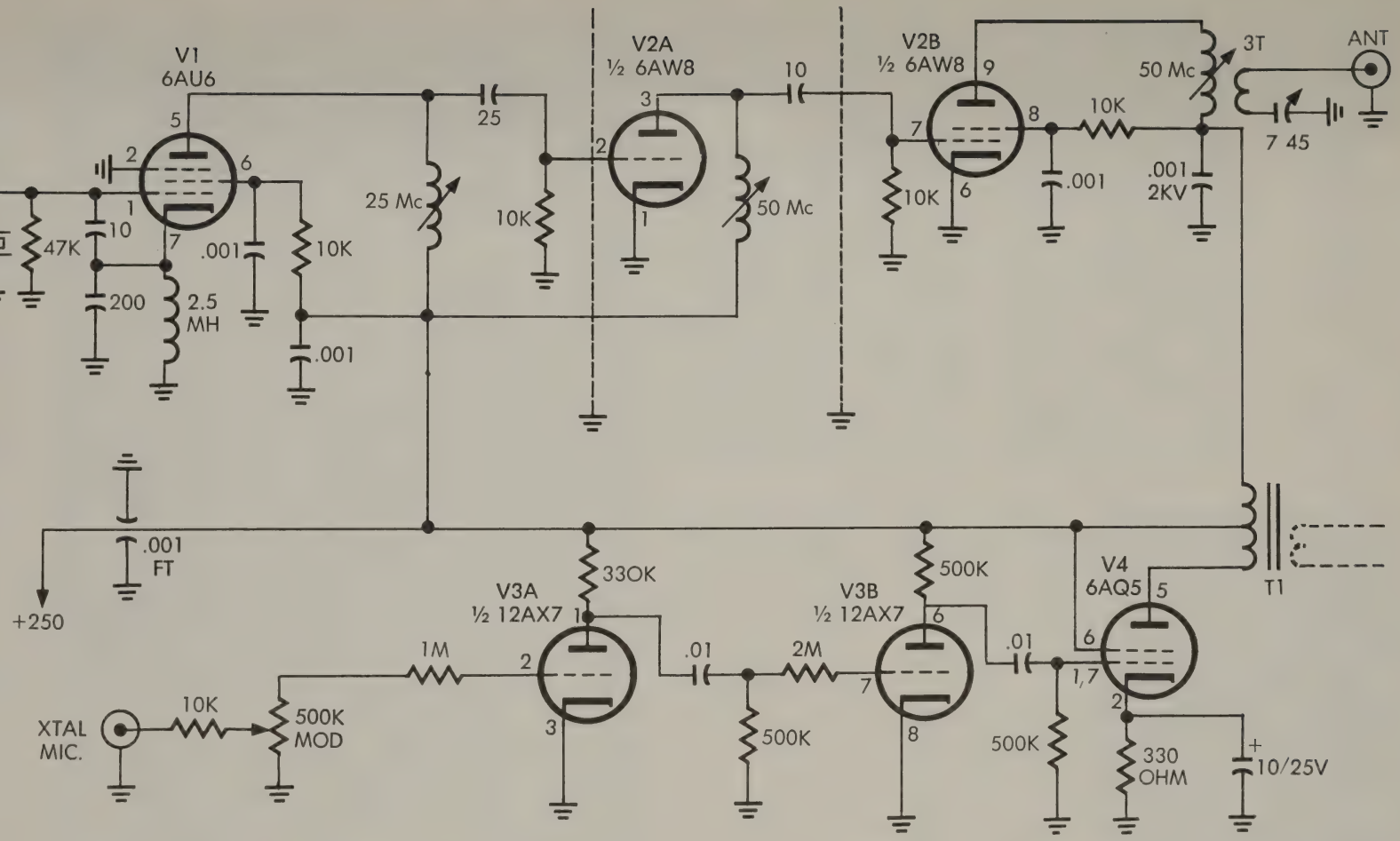
It has been proven that it does not take very much power to work the 6 meter band, as is evident by the number of rigs on the air with less than 10 watt input. Even greater distances can be covered on skip with this power. I've worked over 1500 miles with less than 4 watts input.

Now that I've convinced you that 6 meters is a great band and that you don't need a Brooklyn KW (2 California kilowatts for grid drive) to work rare and exotic DX on 6, the next thing that you'll want to know is how to build a pebble crusher for six. If you still aren't convinced, I work six and can endorse the above statements as being completely true. So there!

The transmitter is quite simple to build, the entire project being able to be completed in about two hours. It is built on a minibox, the size being determined by the size of your junkbox and skill at stuffing an incredible amount of parts into an incredibly small space. The power supply is built on a separate chassis, or power can be stolen from the receiver. The cost is nominal, depending upon where you can scrounge parts, etc.

The only real precaution in the construction is the shielding of the doubler and final plate coils. This is accomplished by cutting a top off a beer can, fitting it to the chassis,

(Turn to p. 31; schematic on p. 13)



SCHEMATIC DIAGRAM of the 6-meter peanut whistle. Capacitor values without decimal point are in picofarads (mmf) and those with decimal points are in microfarads. Resistance values are in ohms. All resistors are 1/2-watt composition except the 330-ohm unit in the 6AQ5 cathode; it is a 1-watt carbon. Tank circuits are of any type which will dip to specified frequencies without added padding capacitance. T1 is an old push-pull audio output transformer (see text); a Triad M-4Z can be substituted with some improvement in performance.

Modifying the Twoer

William B. Maddock, WAϕAIZ
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St. Louis 14, Missouri

The Heath Model HW-30 "Twoer" is one of the most popular transceivers on 2 meters but, especially in metropolitan areas, the super-regenerative receiver section leaves something to be desired in the way of selectivity. The transmitter section is excellent and does the job of units costing many times the price.

The author therefore has conceived and installed in his "Twoer" minor modifications which will permit operation of an inexpensive but efficient printed circuit board converter using the "Twoer" for power supply and as a control unit by retaining the existing transmit-receive switch circuitry. The "T1R" switch with the modification simply makes the breaks power to the converter just as it normally does to the "Twoer" regen receiver. The beauty of the modification is that the "Twoer" can be restored to normal for general listening, mobile operation, etc., simply by pulling a plug and positioning a switch.

In addition to the purchase of the converter, the "ham shack" must have a communications receiver which will tune 5 to 9 MC (standard *if* of the converter). Other *if*'s, in accordance with the manufacturer's instructions, can be used but most communications receivers tune this range.

The converter is a GEM Electronics (Box 203, Tremont City, Ohio) 2-meter printed circuit board converter which comes wired and tested less tubes and crystal. When

MODIFIED TWOER with cables installed, ready for operation. Plug to left of numeral "1" is antenna plug to converter; plug to left of numeral "2" is combination B-plus and filament connector. Switch selects "Normal" (unmodified) receiver operation, "F" for filament power only to converter, and "FB" for filament and B-plus to converter. Additional changes shown but not described in text are the switch above the power light, the phone jack beside the switch and the external crystal socket.

ordering, be sure you specify the converter which uses the 6CW4 nuvistor and 6X8 tube. The crystal is a 46.3 MC 3rd overtone type available from most crystal companies and electronic supply houses (about $4.50 to $5.00 custom ground).

PARTS LIST:

1. GEM Electronics converter (see text) plus tubes and crystal
2. Standard normally closed phone jack
3. Standard phone plug
4. A two-conductor (two-pin) jack
5. A two-conductor plug
6. Approximately 6 feet of coax (see instructions)
7. A two-circuit, three-position, nonshorting switch (a two-position switch will work)

The price of the converter is $7.50. The remaining tubes, crystal and parts for the modification should enable one to make the entire modification for well under $20.

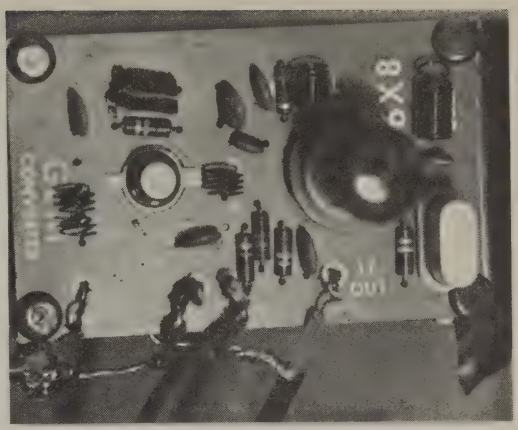
MODIFICATION DETAILS

The modification consists of re-routing existing wiring from the filament and B-plus pins of the existing 6BS8 regen detector to a switch. By use of this switch, filament and B-plus power can be directed to the new two-conductor jack (thence to the converter) or back to the 6BS8 for normal "Twoer" operation, as desired. Use of a three-position switch permits direction of filament and B-plus power back to the regen receiver in one position, direction of filament power only to the converter in the second position and direction of filament and B-plus to the converter in the third position.

A two-position switch can be used by wiring it so that it selects both filament and B-plus in both positions, *i.e.*, to the regen section of the "Twoer" or to the converter; but it will be found that the ability to direct only filament power to the converter for warm-up is an advantage and in addition permits a method of disabling B-plus if neutralization of the 6CW4 nuvistor is required.

The antenna circuit wiring is simply extended and "looped" through the closed circuit phone jack where it remains in "normal" until the antenna plug opens this circuit. With the plug inserted into the jack the antenna circuit is fed via coax cable to the converter antenna terminals. The shield on the coax provides a common ground between the converter and the "Twoer."

Coax is run from the converter *if* output terminal to the receiver antenna input terminal. Shielding of this length of coax provides a common ground between the converter and the receiver thereby making all grounds common.



The GEM converter as installed in the Twoer cabinet. Cables at bottom are input and output leads.

HOOKUP TO AC-DC RECEVERS

AC-DC communications receivers can be used with this conversion (the author's S-52 Hallicrafters is an AC-DC), but you must be cognizant of the big problem with all AC-DC appliances, *i.e.*, shock hazard. With a voltmeter and with your "Twoer" and communications receiver ON, turn the communications receiver power line plug so that a high voltage difference between the units does not exist. Then make the plug.

To turn your equipment OFF, simply unplug the AC-DC receiver (you should anyway) and remember to put the plug back in correctly when you turn it on. I've never had a shock from mine since I have followed these simple rules. Of course, with transformer operated receivers, this problem should not exist.

"TWOER" WIRING

1. Locate the proper positions for the three new components in accordance with Figure 1 or to your own liking. If the dimensions in Figure 1 are followed, be sure the spacing is adequate for your particular components. The size, especially switch diameter, may vary and necessitate a different layout. Once the layout is complete, drill three holes and mount the components in place. A tapered reamer is ideal for making the holes the exact size! If removal of the "Heathkit" nameplate is desired or required in your installation, it can probably be relocated elsewhere on the panel after modifications are completed.

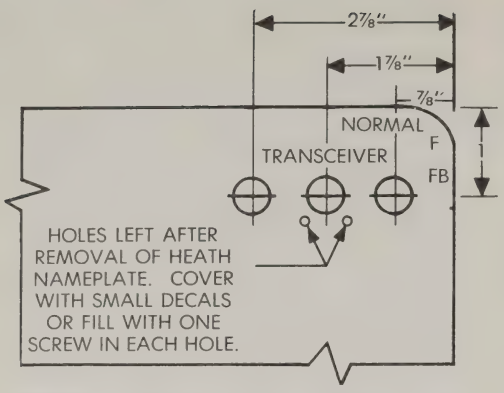


FIGURE 1. Location of holes to be drilled in front panel.

2. Drill a hole (approximately 1/4") between tubes V3 and V4. This hole will be used for the passage of all modification wires. To protect the wires from the rough edges of the hole, install a grommet in the hole. Be careful not to damage components or chafe wiring when drilling the hole.
3. In accordance with Figure 2, Modification 1, locate the B-plus input lug of R11 (250K regeneration control) and unsolder this connection from the control.
4. Splice and SOLDER a length of hookup wire to the end of the B-plus lead just removed from the control (step 3). Cover the splice securely with electrical tape to prevent shorting.
5. Run the remaining end of the hookup wire through the grommet of the hole drilled in step 2 and attach and SOLDER the end to the terminal of the new selector switch designated "B-plus" in Figure 3.
6. Attach and SOLDER a length of hookup wire to terminal B1 of the switch.
7. Run the free end of this wire through the grommet and SOLDER this free end to the R11 regeneration control at the lug where the original wire was removed in step 3.
8. At the new selector switch, run a length of hookup wire from B3 to the nearest lug of the new 2-conductor jack as shown in Figure 3. Note that B2 will not be connected. This completes the B-plus wiring modification.
9. In accordance with Figuer 2, Modification 2, locate lug 1 of terminal strip "S" and unsolder (at the lug 1 end) the choke connecting lug 1 to pin 5 of V3. Be careful not to overheat the choke when unsoldering.
10. SOLDER a length of hookup wire to lug 1 of terminal strip "S" and run the free end of this wire through the gormmet to the top of the chassis.
11. Attach and SOLDER this free end to the terminal of the new selector switch marked "FIL" in Figures 2 and 3.
12. Attach and SOLDER a length of hookup wire to terminal F1 of the new selector switch.
13. Run the free end of this wire through the grommet. Splice and SOLDER this wire to the free end of the choke removed in step 9. Tape this connection.
14. At the new selector switch, attach a jumper wire between pins F2 and F3. Run a length of hookup wire from F3 to the vacant pin (noted as pin 2 in Figure 3) of the new 2-conductor jack. SOLDER F2, F3 and pin 2 of the jack. This completes the filament wiring modification.
15. In accordance with Figure 2, Modification 3, unsolder the lead of capacitor C20 from pin 10 of the "Twoer" transmit-receive switch.
16. SOLDER one end of a length of hookup wire to pin 10 of the T-R switch. Run the remaining end through the grommet to the lug of the new phone (antenna) jack, noted as lug 1 in Figure 3. Trim this wire as short as possible and SOLDER this wire to lug 1.
17. Attach and SOLDER a length of hookup wire to lug 2 of the new phone jack. Run the free end of this wire through the grommet. Trim, attach and SOLDER this wire to the free end of capacitor C20 (removed from pin 10 in step 15). Tape this connection.
18. With an ohmmeter, continuity light or other device, determine that lug 1 of the new phone jack has "continuity" to the center conductor of the phone plug with the plug inserted in the jack and also that "continuity" exists between lugs 1 and 2 with the plug removed. This check will insure that the "antenna" is on the proper pin. If, through some unusual jack construction, the check is not correct, rewire the jack so that the wire from pin 10 of the transmit-receive switch is on the proper pin to cause continuity to the center conductor of the phone plug when the plug is inserted. This completes the antenna wiring modification.

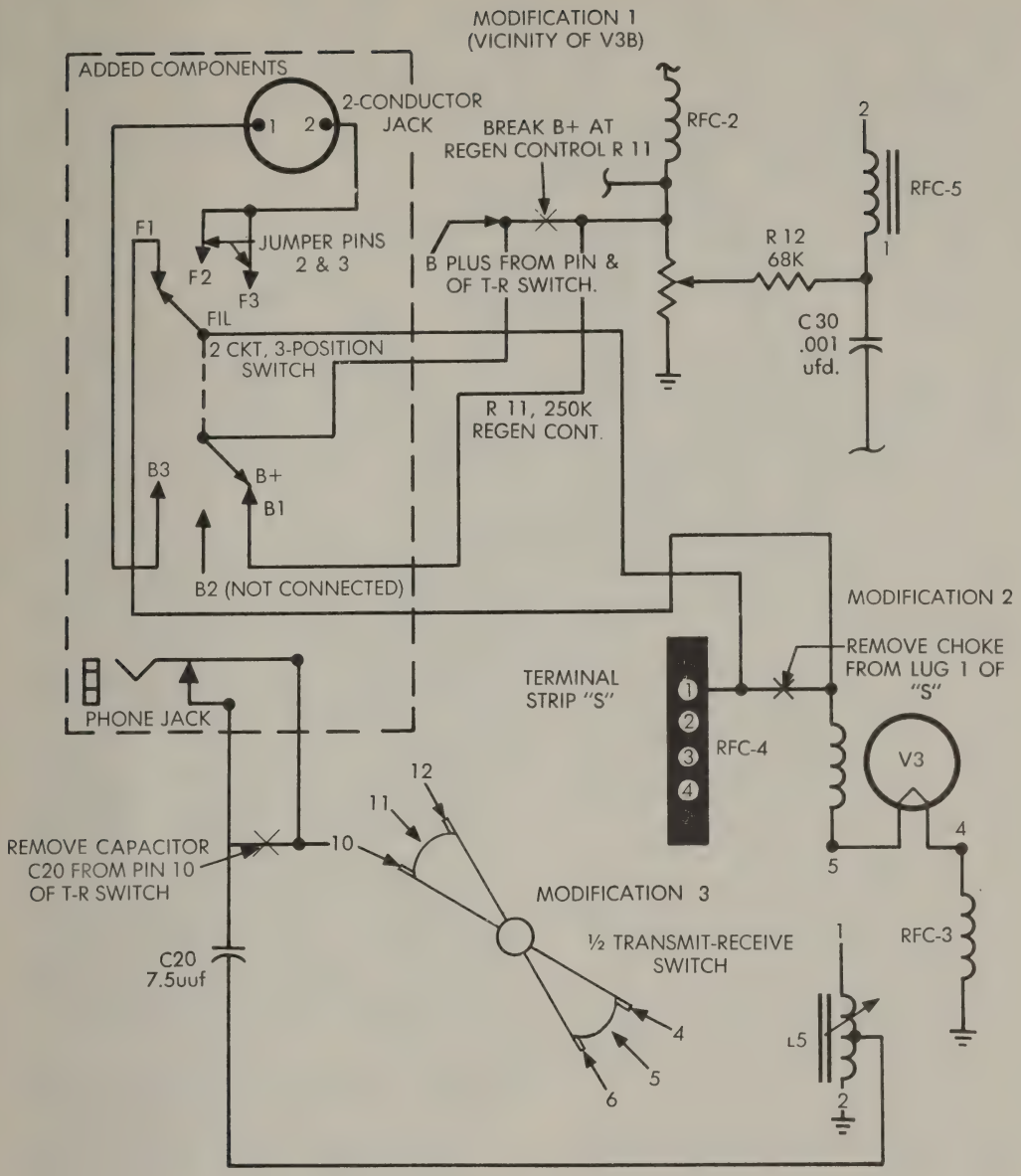


FIGURE 2. Schematic diagram of all three modifications described in text.

CONVERTER WIRING

1. On the underside of the converter circuit board, note that the outer edge is "ground." SOLDER a short length of heavy bare wire (U"-shaped, about two inches long will do fine) to the ground copper strip. SOLDER only the upper tips of the "U" so that a loop is available for shield connection. BE CAREFUL NOT TO OVERHEAT THE CIRCUIT BOARD—SOLDER AWAY FROM COMPONENTS.
2. Prepare two lengths of coaxial cable (one for "Twoer"-to-converter antenna connections; one for IF OUTPUT-to-receiver connections). Strip back approximately 1½ inches of shielding from each end of each cable. Keep the cable lengths as short as your installation permits. If your antenna is fed with 75-ohm coax, use RG-59/U; if it is fed with 52-ohm coax, use RG-58/U.
3. With the converter mounted temporarily or permanently, as you desire, attach the center conductor of the antenna coax cable to the "ANT" terminal on the converter. SOLDER this

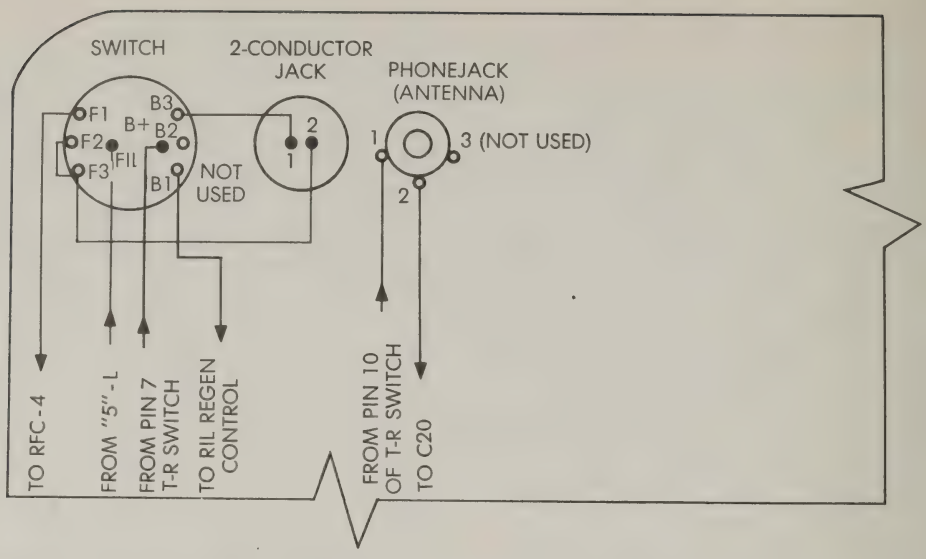


FIGURE 3. Rear view of added connectors and switch showing connections. "RIL" should read "R11".

connection. Do not solder the shield at this time.

4. Attach and SOLDER the center conductor of the *if* coaxial cable to the "IF OUT" terminal on the converter.
5. Attach and SOLDER the shield of the *if* cable and the shield of the antenna cable to the "U" ground wire.
6. Obtain a length of two-conductor wire (the author used AC lamp cord) for the filament and B-plus interconnections. Strip about 1/2" from each end of each wire.
7. Attach and SOLDER one of the wires to the converter lug market "B-plus" and the other wire to the lug marked "6.3V."
8. On the free end of the antenna coaxial cable, attach and SOLDER the phone plug being careful to avoid shorting the center conductor to the shield.
9. With the communications receiver OFF and unplugged from the AC power line, attach the free end of the *if* output coaxial cable to the communications receiver. Attach the center conductor to the antenna terminal; attach the shield to the ground terminal. If your receiver has terminals marked "Ant 1," "Ant 2" and "GND," attach the center conductor to "Ant 1" and short "Ant 2" and "GND" together for proper hookup. The shield, of course, still goes to ground.
10. With an ohmmeter, determine which free end of the two-conductor wire is soldered to the "6.3V" lug of the converter at the opposite end. Carefully ascertain which pin of the 2-conductor plug corresponds to the filament power connection on the 2-conductor jack, then SOLDER the "6.3V" cable lead to this pin. Likewise, SOLDER the "B-plus" lead to the remaining pin of the 2-conductor plug. All wiring is now complete.

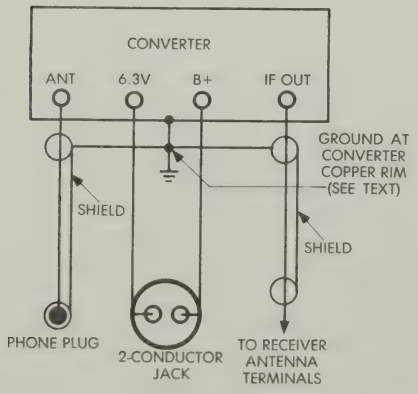


FIGURE 4. Wiring diagram showing hookup of converter.

OPERATION

1. With the antenna plug removed and the new selector switch in the NORMAL or No. 1 (full counterclockwise) position, turn the "Twoer" ON. Operation should be normal. Some slight readjust-

(Turn to page 31)

Pi-Net Design

For the 50 Mc band—and to a lesser extent, for the 144 Mc band as well — the pi-network offers one of the simplest and easiest to operate transmitter output circuits available.

However, as you undoubtedy have discovered if you have attempted to build one, they sometimes misbehave. And very few pi-nets in use on 6 meters today were *designed;* most of them were either copied from someone else's rig, or were hay-wired until they worked after a fashion.

For example, one reasonably active 50 Mc homebrewer, asked about his pi-net design techniques, replied, "Use a 50-picofarad input capacitor, four turns of No. 12 wire an inch in diameter, and a 100-picofarad output capacitor."

It usually worked for him, but when he ignored all the rest of the details such as the power level at which the tube operated, the load he was matching into, and the amount of harmonic reduction needed, he was almost assuring himself of a highly inefficent circuit! The fact that it worked at all is testimony to the forgivinginess of the pi-net's nature.

WHAT IS A PI-NET, ANYHOW?

Many of us seem to have the idea that a pi-net is some sort of tapped tank circuit, and attack the design problem with trusty GDO in hand. This approach usually leads to failure.

Because, unlike most other RF circuits, the pi-net is *not* a resonant circuit by nature. It is tuned to resonance, true, but this resonance can only be obtained when both the input and the output sides of the circuit are loaded by the proper resistances!

The pi-net, you see, is primarily an impedance-matching device. If you go all the way back to basic circuit and network theory, you will find that our popular pi-net actually consists of two L-networks connected back-to-back. The input L-net transforms the high impedance of the output tube plate down to some intermediate value; the second L-net transforms this intermediate impedance to the desired output value.

Pi-nets can be designed by following this two-step approach, and recent editions of the ARRL handbook detail such a procedure. It works and it works well, provided you don't mind filling several pages of paper with slightly complicated arithmetic.

To avoid the arithmetic problem, they also offer a set of graphs in these editions of the handbook. They also work well provided that you want a loaded circuit Q of either 10, 15, or 20. However, they do not provide for intermediate values.

Another approach, favored by many engineers, is to combine the proper L-network equations and so derive a set of equations for the design of pi-networks. These equations are also to be found in the ARRL handbook, in the chapter on electrical laws and networks. They are *not* recommended unless you like to work with compound and complex fractions, take square roots of irrational numbers, and so forth.

Our approach, however, was based on these equations. We simply prepared a set of "nomograms" to allow you to solve these equations with nothing but a ruler or other straightedge.

Before we go into the workings of our nomograms, though, let's look at the various design factors which must be considered in putting together a pi-net.

PI-NET DESIGN FACTORS

Three independent variables enter into the design of any pi-net. These three variables are (1) the input resistance desired, (2) the output resistance desired, and (3) the operating Q of the network.

These three variables, in turn, fix the values of three other dependent variable fac-

tors — the input capacitance, the inductance, and the output capacitance. Frequency also enters into these factors, but for our purposes this is fixed at 50 Mc and is not considered a variable.

The first independent variable factor — desired input resistance—is itself determined by the tube used in the final amplifier, the power level desired, and a number of other factors. While its exact value can be determined only by extensive calculation from the tube's constant-current characteristic curves, a quite good approximation to the desired value can be obtained using only the final plate voltage and the final plate current in milliamperes.

The second independent variable — output resistance — is usually determined by the type of feedline you use in your station. To simplify our charts, we fixed its value at 50 ohms. If your coax is 52 or 53 ohms you'll find no difference at all; if you are standardized on 75-ohm lines, you will find that inductance values are about 3 percent higher than you need — but everything will still be in the right ball park and you need have no worries about using the charts directly.

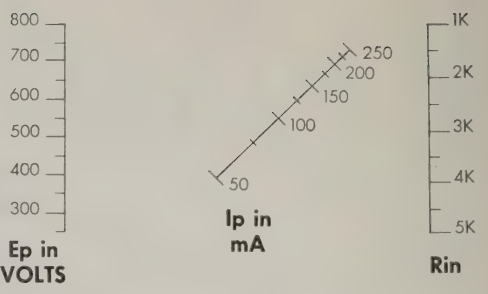


FIGURE 1. Chart for finding Rin.

The third variable — the network Q — is completely up to you, with a couple of limiting factors.

Most textbooks tell you to use values of Q between 10 and 20 for best results. This is not necessarily true in the VHF region. If you are building a linear amplifier, Q should be *at least* 12 and perferably higher, to avoid distortion. In addition, the higher the Q value in a pi-net the easier the network is to tame. We have built amplifiers with pi-nets have Q as high as 50, and found them to be excellent performers.

Only one thing restricts you as you go up with the value of Q. The higher the Q, the

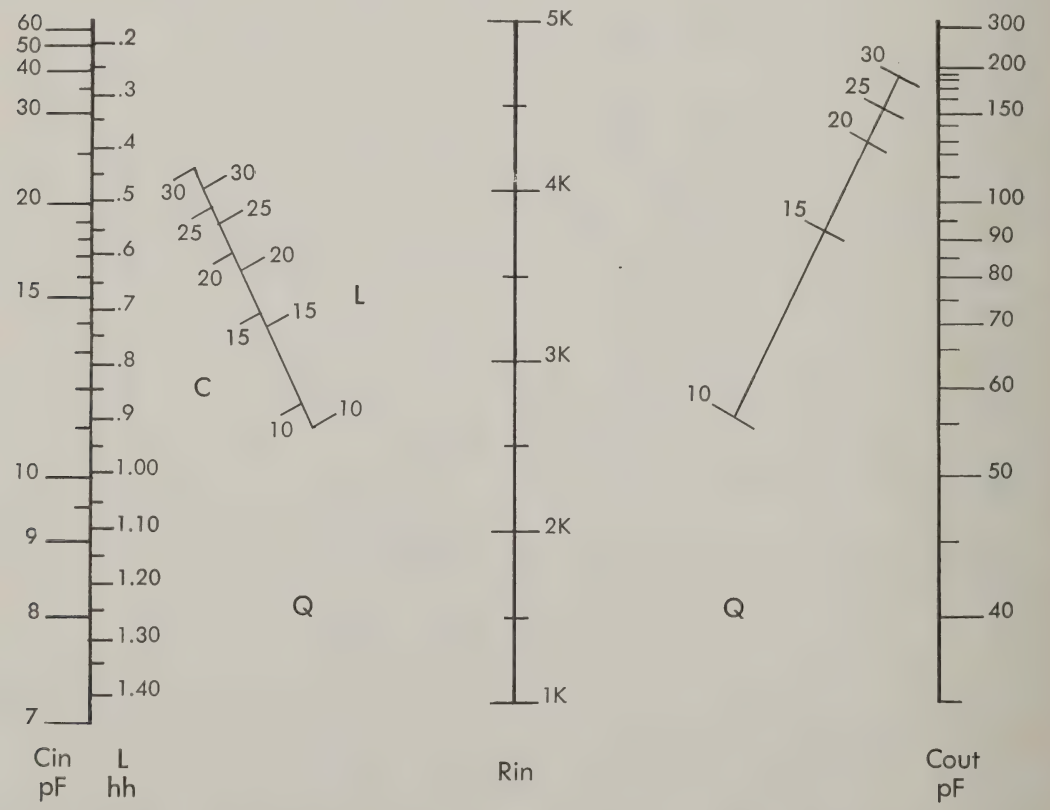


FIGURE 2. Pi-Net Design Chart. Frequency is 50 Mc, coax impedance is 50 ohms. For other values, see text.

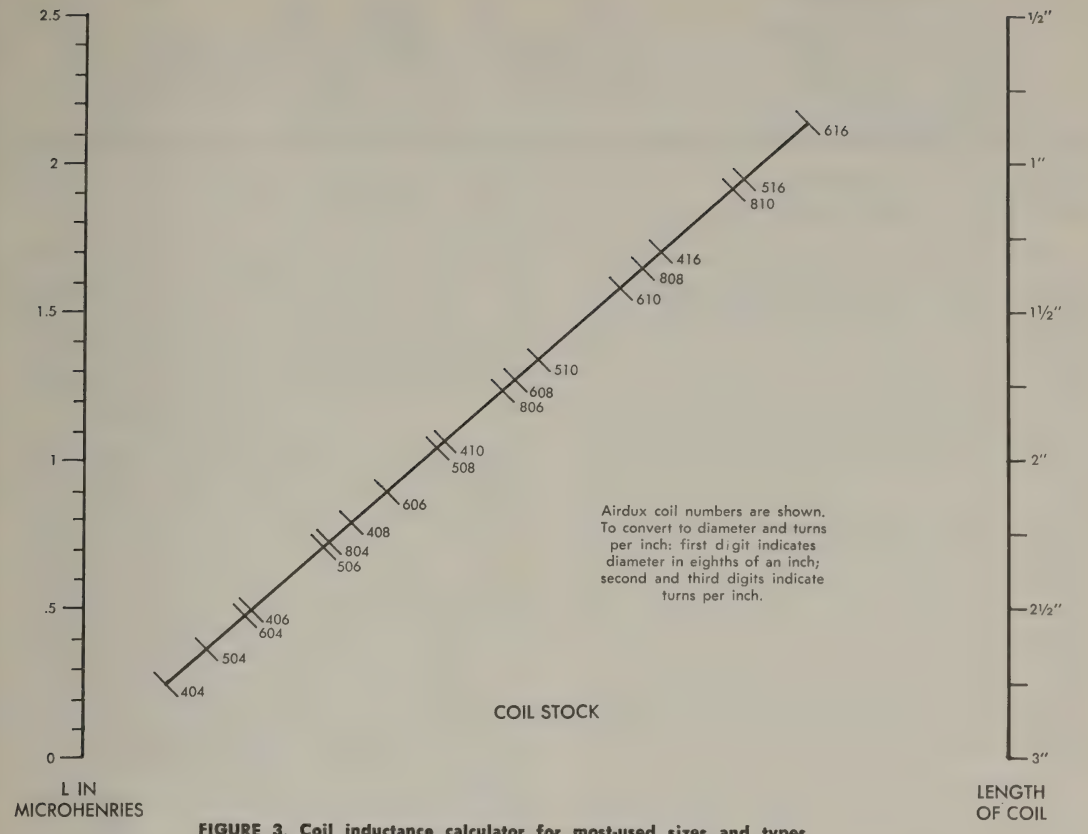


FIGURE 3. Coil inductance calculator for most-used sizes and types.

more current you will have circulating through the inductance of the circuit. With a Q as high as 100, you'll have something like 100 times the current flowing *in* the net as you have coming out to the antenna. If you are running 100 watts output in 50-ohm-line, you will have about 1.4 amps coming out — and 140 amps going through the inductance! This, naturally, produces much heat and also may cause you to lose some power by dissipation in the physical resistance of the coil.

With high-power amplifiers, a Q of 50 represents just about the limit. For general use, we recommend Q values between 20 and 30 as a good all-around compromise.

Our charts show marked values of Q at 10, 15, 20, 25, and 30. You can interpolate between these values for intermediate steps, with some loss in accuracy. However, be *sure* that you use the same Q value for all steps, or nothing will come out right!

USING THE CHARTS

By now you have noticed that we have three charts. Only one of these is concerned with actual pi-network design. The others help you determine the desired input resistance for the net, and find the proper size of coil to give the calculated inductance.

Start with Figure 1, the input-resistance nomogram. Determine what plate voltage you are going to use and how many mils of current you intend to run. Find the voltage on the "Ep" scale and the current on the center scale. Lay a ruler or other straightedge so that it passes through both points, and read the value of Rin where the ruler crosses the third scale. That's all there is to it!

Armed with your desired value of Rin, your next step is to decide what Q you want in the network. Then, proceed to Figure 2, the pi-net design chart.

With this one, we start on the center scale, headed "Rin". Put a dot at your desired value of Rin. Using the left-hand half of the scale, align the ruler with your Rin value and with the Q value you want. Note that the Q scale has two sets of markings; one is marked "C" and the other "L". Use the "C" Q marking first, and read the value of the input capacitor, in picofarads (mmf), from the left-hand side of the leftmost scale.

Now move the ruler to the "L" Q marking, and read the value of inductance desired from the right-hand side of that same scale. Inductance values are in microhenries.

(Turn to page 39)

VHF Lab Reports

THE PARKS ELECTRONICS TWO METER CONVERTER

While Publisher Cooper was attending the ARRL Convention in Portland, Oregon in September, he spent considerable time talking with and meeting Loren Parks, K7AAD of Beaverton, Oregon.

Loren is the proprietor of Parks Electronics Labs in Beaverton. Medical electronics is their field. But Loren is also a very enthusiastic VHF operator, having achieved some fame as a six meter scatter operator and experimenter. Loren recently put his telents to work with the talents of Lenny W7UHF, another well-known VHF-UHF'er in the Portland area.

The result is a new line of two and six meter converters and pre-amps. 220 gear is promised soon.

Following the Portland Convention, VHF received a production sample of Parks' new two-meter converter. For the past four weeks we have been putting it through the paces at W5KHT and W5HCX.

The converter is definitely not amateur in appearance. Some of the refinements may do little to improve the unit's performance, although they do add to its handsome appearance. For example, the top anodized aluminum plate has *every* slug tuned shaft, Nuvistor, plus, and switch identified. The top plate is *not* silk screened. Rather it is actually printed lettering, such as you would expect to find only on tax-payer supported military equipment! The converter is mounted in a very durable black molded plastic case with metal-to-metal bonding from the top chassis plate to a copper coating *inside* the converter case.

The unit uses four (4) 6CW4 Nuvistors. The chassis includes the power supply, and all that is needed in 117 VAC and you are in operation. Input is through a SO-239 chassis mounted connector. Output is through a phono-type connector.

Our unit had an *if* of 14-18 megacycles. The oscillator starts off at 43.333 megacycles, using a 6CW4 as the oscillator. The mixer is another 6CW4. Ahead of the mixer are two 6CW4's operating in a neutralized cascode circuit.

Through this configuration Denny (W7-UHF) reports he is best able to obtain a noise figure of under 3 db. Denny's figures were borne out by a west coast member of the VHF staff who is one of the few amateurs equipped to measure true noise figure.

Of particular interest is the compartment design of the unit. Every stage of the converter is shielded from the interconnecting stages by individual compartments. This helps to reduce any opportunity for stray coupling between stages.

Performance wise, the converter, fed by a 16 element colinear array at W5KHT, proved to be sensitive and well capable of hauling in the DX signals whether the band was open or not. The only converter in town that was staying up with it was W5HCX's 7788 beauty. With the band closed, 200-mile CW or SSB work is no strain. Stations were not available to check out further than 200 miles.

It is recommended that you follow standard good two meter practice with this converter and pick an *if* as high as your communications receiver will accept when using this converter. Virtually any two meter converter will have birdies. The Parks Electronics unit is no exception. In the first megacycle we found birdies at 144.55, 144.86 and 144.98. Picking an *if* range higher than 14-18 megacycles would have probably helped this situation.

Parks has made trap stubs available to eliminate the birdie problem. Full data is packed with each unit.

With the antenna disconnected from the converter, all is quiet. The S meter rides on S *nothing*. Even with the *if* strip RF gain cranked wide open, the silence is deafening. Adding the antenna to the converter brings the noise up immediately however, indicating that all is apparently well in the noise figure and gain department.

Price for the Parks Electronics Converter is $54.95. It is currently only available from the manufacturer, except for a few dealers in the Northwest.

Vital Happenings & Facts

OPERATING AND DX NEWS

SIGNS

The last 12 months have been very much devoid of aurora. Two-meter addicts, in particular, have felt the demise of the state hunter's best friend.

During late September and through most of October the earth's magnetic field was acting up however, and there were ominous signs that auroral DX may not be too far away once again.

For example, the gang meeting in Syracuse, New York, at the big VHF shindig were chomping at the bit because WWV had been sending "W3" for several days.

To the un-initiated, our National Bureau of Standards transmits propogation information twice per hour noting the general status of Trans-Atlantic HF conditions. They use a code made up of the numbers 1-9 and the letters W, U, and N. N is for normal, U is for un-settled, and W is for "watch out!" A 'W' or 'U' followed by one of the lower numbers (1-4) usually indicates that the magnetic balance surrounding our earth is out of balance. And when it acts up, auroral displays are usually not far behind.

There were other signs of unusual ionospheric conditions in early October. A double hop sporadic E opening from southern California and Arizona to Florida on six meters October 4th was definitely out of the ordinary. A three-day run of E skip October 4, 5, and 6 was just as unusual for those stations in the 4th, 5th, 6th, 7th, and ϕ call areas affected.

Last but not least, K4RUG's contact with HC1FS, Quito, Ecuador at 1310 CST on October 6 was rather unusual as six-meter contacts go. The HC1FS signal was solid and over 9 in strength in Pensacola during the entire 10 minute QSO, much like our old friend F2 skip. Yet we all *know* that F2 propagation won't be back for several years.

Even two-meter tropo conditions were interesting during October. The evenings of October 8-12 produced considerable DX in the under 500 mile range throughout the northern and southern mid-west.

So you weren't paying much attention to six or two during October? That'll teach you!

This month's Vital Happenings and Facts file is just bursting at the seams, thanks to the DRP program (see Coop's editorial on page 1). So let's pitch in!

50 Mc actually has a serious contender for news this month—144 Mc! And it's not because six meter news is down. Two meter news is just up! From Seattle, Washington, W7ZQX reports he is sitting on 50.0056 Mc every Saturday and Sunday morning from 0700 to 0930 PST. His schedule calls for scatter skeds to W6FZA and W6NLZ as well as others in there trying. George runs the full KW to a 4-400A on CW, or 600 watts AM phone. Next stop SSB, hey George? Oops . . . here's a P.S. that notes George is now on 50.110 SSB on six. The line for Washington SSB contacts forms on the left.

K7AAD is temporarily QRT with downed antennas courtesy of the October Oregon huricane, he reports. We imagine many other W7's are in the same boat.

Gerry Stephens, W9SLM, is a newcomer to six in Sheldon, Illinois. Although running a Communicator 4 and 3 element beam, Gerry is hooked on VHF now that he's nailed 24 states in short order. He's working on gear improvements as time permits. Another Illinois station on six is looking for tropo scatter contacts. K9UYK, Jim, in Moline, has a pair of 4E27A's perking at 600 watts. He's espcially active from midnight to around 3 AM because of Indian trouble. The beam should be a six element Telrex up 62 feet as this is read. Contact Jim direct if you want a sked. He'd looking for 'em.

W7EMX, out in Bellevue, Washington is looking for data on a KW linear for six meters. Can't imagine why he feels he needs more power tho . . . his DX worked includes all JA districts but 4 and a good collection of VE, KH6, KL7 and XE1 sta-

tions. Contact him direct if you have the dope he needs. And send VHF a copy of the schematic . . . lots of fellows need this one!

K1RVM, Shelton, Conn., worked W4VPJ down Florida way on October 2 at 2035 EST. Sigs were 59 plus both ways. RVM is searching for data on parametric amplifiers for VHF. What say, Sam?

W4HHY, Nashville, Tnnessee, put 50 Mc ground-wave to work he worked WϕBBM, Imperial, Missouri, at 2035 CST on Sept. 14. Two way SSB.

WA2VOI is building a parametric amplifier for 50 megacycle. Before you learned ones scoff at this idea, let's ask . . . "Have you tried it yourself?"

W5JGV in Metairie, Louisiana, should be putting out a real powerhouse signal on six these days. He's just finished a 4-1000A final amplifier for 80 through 6, which includes 500 watts of A3 for those who haven't discovered SSB yet.

WA5CQN/K5UKM operates from Okmulgee, Oklahoma while in school. He advises that he worked skip on Sept. 10 with VE3BPR and W3CLQ coming through from up around the lakes. He needs data for getting his DSB rig on frequency.

E skip hit throughout W4, W5, W6 October 4, 5 and 6 with some double E skip reported. All openings occured between 1600 and 2100 LST.

K5KLU modified his tape recorder for remote control and improved his monitor scope during October. Bob hangs out in Dallas on 50 Mc SSB. He's searching for information on a transistorized VHF SSB system. We have to refer to our man about compact VHF SSB, Sam, K6VLM. What say Sam (not 1BU this time!)?

K9BEH reports hearing W4's from Florida during September at his New Bedford, Indiana, QTH. He started an audio compression unit (which is great for weak signal VHF work) and is looking for information on a good 14-18 Mc *if* for VHF. Hang around OM . . . Editor Kyle's working on a VHF *if* strip right now.

WA2TQT, New York City, improved his six meter walkie talkies during October and worked W9EHN on skip way back on September 6. He's looking for data on a six meter transistorized receiver.

W3JUD, Malvern, Pa. added an International Crystal six meter converter during September and did design work on a new 50 Mc AM exciter. Reason for no DX? His rotor quit! That's no reason OM—check the report in the October issue and get it fixed!

CIVIL DEFENSE exercise in Oklahoma City drew some 30 50-Mc operators. The full-scale test, involving police, fire and hospital facilities as well as hams, lasted some two hours. K5VRL, shown with mobile unit participated—as did W5EZG, W5FMX, W5VCJ, W5HUJ, W5DDE, K5VFR, K5MJY, K5IRO, K5EVI, K5HQP, K5WNA, K5VVZ K5QNN, K5MYW, K5LRE K5LMM, K5RRQ, K5VRL WA5BRQ, WA5BNZ, WA5CZN, and WA5CFZ. County RACES radio officer (and VHF author) W5PPE acted as NCS. Photo by K5EVI.

K9POX, Chicago, built up an FM modulator for his Gonset VFO, now working on six. He's searching for data on 50 Mc FM and SSB. Anything to beat the Indians . . . we guess.

As noted earlier, K4RUG literally pulled the 'rug' out from under all of us in October by working HC1FS at 1340 on October 6. Charlie was running 70 watts into his 5 element beam when he made the grade. That'll teach the rest of us to *work* Saturday afternoons!

K1MUC put W1KN, the Tufts University station, on six meters during October, at Holbrook, Mass. He reports six opened to W4 on October 3 at 2300 EST with 59 signals. He's looking for information on receiver construction.

K9DNW/7 is operating from Pinedale, Wyoming, on six these days. He's just finished up a 2E26 final for his 12AT7 rig so watch for him when the bands open that way.

WA6USW out in Santa Ana finished up his six meter ground plane and Heath Tunnel Dipper during October. He's search-

ing for six meter mobile equipment. Some of you L. A. section gang give him a hand.

K7JUE, Tempe, Arizona, says he's rebuilding for six meter scatter with a KW on CW and SSB. The antenna is an 11 element Telrex 71 feet above the ground. We should *all* hear him when the final is finished. He wants skeds by the end of December.

Some of the old 6 meter gang out on the west coast will remember Ken, W6NDP, of Fresno fame. Ken is presently working at Hewlett Packard in the microwave section after serving his military hitch. And he's talking about getting back on VHF soon. Ken was the very *first* station in the west (and perhaps the country) to work random ionospheric scatter contacts when he hooked a Seattle station one morning in the spring of 1956. He's in Palo Alto now . . . and only needs a little encourgement to get back active.

144 Mc activity from coast-to-coast is apparently very good. W5BAU in New Orleans reports working WϕQDH/ϕ in Kansas on October 9th during an extended tropo opening over the mid-southwest.

A nice letter from Mr. VHF/UHF in Michigan, W8PT, fills us in on all sorts of news from that area. Jack writes (during this year's Perseids) "worked W4TLC (South Carolina) for state number 39 and W5KFU (Texas), both contacts very FB. Had previously worked W7JRG, K7HKD and WϕENC who all had beautiful signals this year. Other skeds were kept with W6WSQ — nothing heard — and K7IDD (several good pings heard and he heard a short burst on me). A little too far and a little too much mountain. Other stations heard, W7FGG and W2AZL (off back of beam). Shower peaked the 17th, but signals were just as loud on the 13th. I believe it was a very good shower and some of the boys are expecting too much. They expect to work a couple of thousand miles and it just can't be done-or at least has never been done (I keep trying). W4LTU says we should try to get maximum trail height by using meteors that are just grazing the ionosphere and to get the metors in this position means that you should sked right around the time of rise and the time of set indicated for the radiant. Over 500 miles is a long shot at best. I am looking for skeds with Maine (only state needed east of the Mississippi), New Mexico, Arizona and Idaho. Have heard W7LEE in Parker, Arizona (last year). Am continuing skeds with K7IDD in Utah during all major showers. Also we sked on 14.110 c.w. Sundays at noon EST. Anyone want to join us?" Jack's two meter station includes a 1 KW final for CW and a 20 over 20 array from Telrex.

Moonbounce on two over the equator? Interesting to contemplate anyhow. ZS6IF (South Africa) has been granted experimental moonbounce power of considerable level (Eimac donated four 4CX250B's). Someone out *there* probably will want to sked him. Wonder if the mount's el az or polar? So does W4BUZ, who reports this item.

Eastern and mid-west two-meter DX frequencies and schedules also courtesy of W4BUZ's 'RAGCHEWER' publication out of North Carolina. W1COP in on 144.075 (Maine), A3. K4IXC (Fla) on 144.090, calling CQ 'N' the third 15 seconds of each minute after 2100 EST daily. K2LOK, Buffalo, New York, is on 144.072. VE2LI, Montreal, is on 144.222. WA4ISR is on 144.080 from Virginia. W4TXD is on from the same state, 144.018. K2VCT from Northern N. J. is on 144.027. W1TJW from Mass. is on 144.005. K1RGO, Connecticut, is on the same frequency. K3QAX, Pennsylvania, is on 144.025. W1JSM, Mass., is on 144.018. K2ATA, also N. N. J. is on 144.015. WϕEMS hangs out on 144.092. WϕQDH/ϕ is on 144.270. WϕENC still operates from 144.150 in S. D. K9UIF, Chicago, is on 144.186 now.

W2ESX skeds daily save Monday W4CSN on 144.070, ESC transmits from 2145 to

2 METER SSB REPORT FROM K9EID

Bob Heil, well known VHF'er located in Marissa, Illinois, just across the river from St. Louis, recently completed a new two meter SSB kilowatt and finished installation on a 32 element (8-8-8-8) 'J' beam, 110 feet above ground. As might be expected, the results have been more than worth the effort. Bob reports SSB activity in his area is on 145.05 Mc, USB. He has worked WϕYMG, Wichita in Kansas, W5UGO, W5DBQ and K8UTY/5 in Oklahoma, WA4BYW in North Carolina (!), W5TIE in Arkansas, W4ZNX in Memphis, and he maintained nightly skeds with WϕDDX in Kansas City, Missouri (270 miles approximately) without a miss for 3 weeks running.

2150 EST and VSN transmits 2150 to 2155 EST.

W4ZEY, W4KCS, WA4FDY, WA4HYE and W4GVB are setting up a VHF club station on Oxford Furnace Mountain some 9 miles east of Lynchburg, Virginia. The Quintet already has up a 60-foot tower with stacked 5 element yagis (50 Mc) and stacked 7 element yagis (144 Mc) mounted. The station plans to operate from 50 through 1296 from the mountain location.

K7HBG finished up a two meter converter and 8 element beam during October. DX was nil. He's in Seattle.

Bob Clark, WϕQIN, reports from Minnesota that WϕRSP (S. D.) is on every evening with his 32 element colinear and 850 (!!) watts. WϕYSJ, Fargo, N. D. and WϕPHD, Warren, Minn. have been working VE4TL on two meters. WϕWVM in St. Paul has completed his dual 11 beam—one vertical and 1 horizontal. WϕQIN keeps plugging away with his 16-element colinear, as many of us do. Bob suggests that VE8BY may be going on two meters soon. Anyone know for sure? How about it Pete . . . what *are* the details?

W4VIM from Greenville, S. C. added a new rig—single 4X150 driving a pair of 4X250B's on 6 and 2 to his shack this month to operate AM, CW or SSB. He expects to be active again around the first of the year. Beams are now 60 feet up.

WA6TOZ, West Lost Angeles, finished up a FSM-SWR bridge for two meters and reports he is working on a 144 transistor converter for a transistorized BC receiver. Sounds like others would like to read about this one OM. What say?

WϕGXJ, Cedar Rapids, Iowa, reports working a number of DX stations on September 13, 20, 25 and 29, for the most part 9 area stations. His 6DS4 pre-amplifier is AVC controlled. Sounds good . . . how about the details?

K4HVE, Greensboro, N. C. started his 7788 pre-amplifier but doesn't have it finished yet. Others in the area might check with him.

WA6YOB, San Rafael, California, improved his Heath Twoer during September. Suggest you catch the article in this issue for further improvements OM.

WA8AHU added a Nuvistor pre-amp to his Communicator 4 . . . and he's searching for information on a 2 meter KW final. This issue OM.

K9EJK, Spencer, Indiana finished up a 12 VDC, 600 VDC transistor power supply circuit and is looking for a hybrid or transistor TNS circuit. So is VHF. Anyone have one?

K6YCX is interested in receiver design material, noting he modified his Seneca for push-to-talk during the past month. He's in Pomona, California.

K5PXO, Fort Worth, finished up a new two meter converter featuring a 7788-6AM4-6688-5656 tube line-up. He needs data on 144 and 220 helical (cork screw) antenna designs. Any helpers?

K8IFL, Ironwood, Michigan, got his Tecraft to HQ-129X system working and immediately worked 8 stations in 3 states from his far north location.

K7LUQ is looking for a two-meter coaxial tank circuit for two meters. He reports working Spanish Fork, Utah, over a 60 mile mountainous path this past month. He is searching for parametric amplifier data for 144. Sounds like the makings of a real two meter DX set up here.

W5EIX, Stillwater, Oklahoma, wants a two meter conversion for the Link FM 150 megacycle gear. He's working on converters for six currently.

K2ZZ1/8 in Columbus, Ohio completed a transistorized mobile supply for two and field strength meter and improved on a homebrew 2E26 rig, working over the stability. He asks if back issues of VHF are available. July is, a few September are, and a very few October are. All out of August. $.50 each.

W2EIC, East Meadow, New York finished up on a 125 watt linear for 144 and he needs an APX-6 conversion. Who can help?

K7GGJ, Yakima, Washington, has a new 829B rig on two and he needs data on a code wheel lash up. Our best information tells us that Loren Parks, K7AAD, has a real fine code wheel be builds for $25 each. We have one here at VHF and can vouch that it is a whale of a bargain for the price. Write Loren directly.

K2JFV reports he has been on 144 SSB for three years now, and just recently completed a new 6360 linear for his rig. He drives his two meter mixer with a KWM-2. Wants data on a high powered linear for two. W5HCX has one this issue.

K6RHR, Burbank, California needs converters (used will do) for the 220, 144 and 50 megacycle bands for his NC-300. He can pay $15. each plus postage. Anyone have some oldies kicking around?

WϕJHS reports listening on the MARS propo 6-2 frequency of 143.95 and hearing AFϕRSP in Marvin, S.D., but notes that he can work the S.D. station at will inside the two meter band. Phil is now located 18 miles north of Minneapolis.

W9WIC in Cicero, Illinois is active on 2 with a Communicator and 5 element Hy-Gain beam anytime after 6 PM and around 7:30 Chicago time. Look for him . . . he's a real VHF Booster!

ANNOUNCEMENT: The 4th Annual V.H.F. Christmas Dinner Dance will be held Saturday, December 1, at the Roger Young Auditorium, Los Angeles. Pre-registration closes November 18 but tickets will be sold until the 27th. Lots of door prizes and the likes. Over 250 turned out last year. Tickets and info are available from K6MYK, Millie; WA6TZO, Elayne; and Darle (WA6KLP) and Larry (WA6KLQ).

Here in Oklahoma, staffer Russ Miller, W5HCX, is on with a new 40-element yagi array (box array of 8, 5-element yagis) which he promises to tell us all about soon. It replaced a 16 element colinear.

220 Mc still manages to pop every so often. W5AJG (LeRoy-Dallas) promises to give W5KHT a test signal when Bob gets his 220 gear going from Oklahoma City. W40AB, Charlotte, N. C., has a 6360 220 exciter going, and has re-installed his antenna after a big blow last August. W2SEU, Freeport (on the Island), New York, reports new 220 activity in the NYC area includes K2BLU and K1BHY. SEU's frequency is 220.050. Look for him.

Jack, W8PT (10 states in 5 call areas on 220) wonders where are the 50 stations that Ben, W9OVL, Chicago reports active in Chicago are? Jack has keen working 220 for years and hasn't heard more than 20 different stations in 5 years and not over 10 in the past 2 years. Jack keeps skeds with W9REM, W9RPF and W9SKN on Monday nights. All hang out between 220.0 and 220.1. Time is 2130 EST and Jack's frequency is 220.052.

432 Mc continues to be the most popular 'above 144' band. K7MLX Bob, of Seattle, is searching for information on some 432 equipment for sale, FM preferred. Bob wants to set up a 146.76 FM repeater using 432 Mc as the up-link to the repeater.

432 Mc activity is on the rise in the Los Angeles and San Diego areas according to K6GKX. Ralph says this could be done to the proposed 432 repeater to be established on Santiago Peak. The repeater is expected to cover the southern part of the state from the Mexican border to Fresno. And that's a lot of area! Advanced information indicates that some 10 or more new 432 stations will be operating on frequency very shortely. More 432 round tables can be heard nightly from 2000-2200 and Saturday and Sunday mornings from 8-9 AM.

W4OAB, hoping to make his VHF activity across the lower four bands a complete sweep, has finished a 432 cavity.

W5BEP has completed his 432 converter in Longview, Texas. Also down in Texas, LeRoy, W5AJG, reports almost daily contect from Dallas with Houston area stations around 0700-0830 CST. If you have a converter perking, you should listen to the regularity the boys are able to work on this long 432 path.

WA6BTH has finished up two 440.4 meg 13 element yagis and improved his A5 (TV) converter. He's working on a TV set up, in San Francisco.

W5HPT in Bedford, Texas, is another one heading for 432. He finished up a converted ARC-27 as a tripler and a 432 amplifier for 432 this month, per W5AJG.

Jack, W8PZ, reports a schedule with W8RQI at 2130 EST on Tuesdays and Thursdays. Jack's on 432.003 CW. He's been on 432 for 2 years and is looking for new states. His converter is a 416B job. His transmitter at present is a 5894 tripler driving a 5894 final at 48 watts. He's working on a 4X150A cavity doubler driving a 4CX-250B cavity final at 500 watts. Antenna system is 4-15 element Wegner Brothers yagis in a quad at 50 feet. How about a detailed article on your new doubler-final when it's finished, Jack? About the time the power limit is official, let's say!

And-up— K3PBU, Forest City, Pennyslvania, is looking for data on surplus kylstrons for 3300 Mc activity.

W5HPT is another one, down in Bedford, Texas, searching for 1296 and 3300 information. Our Texas reporter would like to see some articles on Rock-Lok transmitters and receivers. Well?

2-M Linear . . . from p. 7

front panel and its stator connected to the "L" bracket.

Grid tank components and the bias supply parts are all located underneath the chassis along with the filament transformer. When laying out all the parts on the underside, be sure to leave room to mount the blower. It is pretty easy to occupy all the room underneath and forget (like we did) to leave adequate mounting space for a good sized blower. Incidently, the one used in the rig is a 60 c.f.m. unit which more than cools the tubes.

The antenna relay for the linear is one of the Dow-Key series (DK-60-G2C) and its external relay contacts are used to ground the 4CX250B screens when the rig is in standby. This helps to cool the tubes since no idling current is drawn when the linear is not being used.

Mounting the RF output jack will require the use of a suitable bracket that will allow the jack's solder connection to be butted up against the stator of the loading capacitor and soldered. Connecting the output jack to the relay can be done with a short coax jumper.

When finishing up construction of this type of final, check to be sure that the air leaks around the bottom of the chassis are kept to a minimum. Use plenty of screws to fasten the bottom plate to the chassis and no trouble will be experienced here with air leaks. Where shafts have to be run through the side of the chassis (grid tuning), use rubber grommets to provide a tight seal. Also, with this particular linear, we experienced air leakage around the meter but cured this by wrapping the meter with tape where it contacted the chassis. Make sure also that all the plug connections are fairly air-tight and where connections must be run to special points like to the external contacts on the antenna relay, the use of feed-thru capacitors is recommended.

OPERATION

Setting up and using the linear is easy if the recommended voltages are applied to the tubes. This is strictly a case where the manufacturer's data must be adhered to, depending upon which tubes you want to run in the rig. This linear has been running with 1400 VDC plate voltage and 300 VDC screen voltage. The idling plate current is 200 mA and average plate current (SSB) is 500 mA. A bias voltage of about 40 VDC negative gives us the resultant idling current.

The drive requirements are only 6-8 watts with the value of swamping resistance used in the rig. Where higher power exciters are used, this value of swamping resistance should be lowered and its dissipation rating increased.

If the 4CX250B tubes are to be used, the aforementioned values are appropriate. However, if the 4X150A is to be used, the manufacturer's data should be consulted for the proper values. In constructing the screen and plate power supplies for the linear, include satisfactory dynamic regulation. The screen supply can best be regulated with VR tubes since the screen current will not swing far enough to extinguish them. The plate supply should be well choked and filtered; the more filter, the better.

Incidently, the linear described in this article has been operating for about 8 months now with no trouble whatsoever. A lot of DX has been worked with it and the comments received from various stations have been excellent. Happy hunting.

airmail YOUR report

D. R. P.

Syracuse Report, 1962

Two "regional" events every year hold national significance to most serious VHF hams. One is the springtime Dayton meeting; the other is the autumn Syracuse VHF Round-up.

The Syracuse shindig has been held every year since 1954, sponsored by the Syracuse VHF Club, Inc. In years past, it has drawn as many as 600 hams from all over the country to its one-day schedule of activities.

But this year's Roundup, number 8, must have set a new record. More than 750 VHF-minded hams came from as far away as sunny California, to hear a star-studded panel of speakers and to swap ideas with other experimenters in the land above 50 Mc.

You could almost have called it a UHF Roundup this year, as a matter of fact. Most of the program—and a majority of the "parking-lot program" of talk session—delt with the region above 300 Mc. It was nothing uncommon to hear 6 meters referred to as "a DC band".

Stellar attraction of the event was the talk by Tommy Thomas, KH6UK, and Sam Harris, W1FZJ, on their historic Mass.-to-Hawaii contact on 1296 Mc, via the moon. They played tapes of the contact for the gathering; for many (including VHF editor Kyle), it was their first real taste of Moon-bounced signal.

Did we say signal? After you listened long and hard, with luck, you could barely detect changes in noise level—but they made sense as dits and dahs, and they carried all necessary information for a complete contact!

Other speakers on the program included Dave Geiser, WA2ANU, who discussed connectors and transmission lines at VHF. He also revealed a method of using sets of quarter-wave coax to match almost any impedance to almost any other; a paper on it will be forthcoming in QST, he said. (Wish we could have gotten to him first; it's a neat trick!—jk)

On a slightly deeper level, Robert Rafuse, W1RUD, assistant professor of engineering at M.I.T., spoke on varactors as frequency multipliers.

Among points made by Dr. Rufuse was the interesting fact that *any* junction rectifier is, by definition, a varactor (it has junction capacitance which varies with the applied voltage, and this is VARiable reACTance) and *may* be usable as one. However, those crystals specially processed for such use are far more suitable for most work.

Although the event was scheduled only from 12 noon to "after 9" on Saturday, October 6, it actually began perking Friday night and lasted through Sunday morning. Sam, Tommy, and the gang from the Rhododendron Swamps were on hand when VHF's representative arrived (through courtesy of Tony, K2ZOJ, who waited 3 hours at the airport!) at 3 a.m. Saturday. Sunday morning's nonprogrammed activity included a special breakfast gathering of Sam & Co., the New Jersey Windbaggers (of whom more later), and Raa from VE3 land. VHF couldn't be there because of plane schedules —but it sounded most interesting . . .

In addition to the speakers, some of the top-notch VHF calls represented at the meet included W1OOP, Hank Cross; W2AZL, Carl Scheideler; W2CXY, Walt Morrison; W4LTU, Walt Bain; K2TKN, Bill Ashby; W1QXX, Jack Wilson; and W3TDF, Ray Bilger. This isn't by any means intended to slight anyone we may have left out—but you can't remember them all!

Items of interest discussed in some of the impromptu talk-fests between program events included Ashby's synchronous-detection scheme described recently in 73 (he had a transistorized version with him) and discussions of winter plans for 432 Mc on the East Coast.

Interestingly, almost all 1296-Mc work in the east has closed down for the winter and is not expected to resume before Spring ("I

just finished my receiver and nobody can send me a test signal"—W2CXY). The major emphasis this winter will be on 432.

Ashby has completed a 19-db-gain "illuminator" antenna with which he intends to run a beacon signal on 432.000, keyed with ID and his home phone number. He expects the beacon may be heard throughout the east during good aurora sessions. The "illuminator" consists of four stacked corner reflectors; half-power beamwidth is 90 degrees!

W4LTU reports a soft final-amp tube is giving him troubles on 432, but he expects to return to the band soon with replacement of the bottle.

At the Saturday night banquet, the traditional trophies for National, Eastern, and Western winners of the June VHF contest were awarded.

Taking the National trophy for the third time—and thus winning permanent possession—was the Waltham Amateur Radio Association, Inc., which numbered among its leaders the aforementioned W1QXX and W1OOP.

Upon taking possession, the group announced that they were donating a replacement trophy—and in addition were establishing, effective with the next contest, a home-station trophy for top home-station scorer in the New England region. "We have to keep somebody at home to be able to work off the mountains," explained Jack.

Winners of the traditional "aurora-copying" contest held during the afternoon were K2QBW, in the CW division, and K2BVC, in the fone sector.

In addition to these awards, special plaques—the Syracuse VHF Club Award for Outstanding Achievement—were presented to Sam and Tommy for their 1296-Mc work.

Chairman of this year's Roundup was Bob Stewart, K2PKL. He was ably assisted by K2ZRX, W2RHQ, K2YFY, WA2GTG, W2MTG, and the rest of the club membership. If you missed it this year, be sure to plan ahead for the 1963 edition! —K5JKX

Scatter . . . from p. 3

made a lot of Technicians mad. The first, referring to those persons who acquired a Tech license "to talk" on 6 or 2 meter phone", said "Under these conditions these 'Technicians' (and this is using the word loosely), are no more than *glorified Citizen Banders.*" The other, further down, said "No one is being hard on the CB'ers or Technicians. If they wish to operate in the frequency bands that are alloted (sic) to the amateur service all they need to do is to pass the license requirements for a General license."

Reaction in the Virginia-North Carolina area was swift. A group of Techs met on Sept 9 and formed the Technicians Very High Frequency Association, under leadership of Chairman E. L. Phifer, WA4AYP. I am advised that the group hopes to become national in scope.

One of the first acts of the TVHFA was to dispatch a two-page letter to the League to "take exception" to the remarks of Virginia SCM W4QDY. Like the editorial which triggered the situation, this letter is too long to quote in full in these pages; if you want one, I'm sure OM Phifer will supply you a copy.

But they do have some interesting comments — and many of them could have been almost word for word from last month's "Scatter." (I know they weren't because this all happened before last month's issue came off the press! Nice to know somebody out there thinks the same way I do!)

"It has been our understanding," wrote TVHFA, "that all amateur frequencies exist solely for experimental purposes . . . Our quarrel is not with the General Class licensee. It is with a system that places the Technician Class licensee apart from the amatuer fraternity as a whole, brands him as a second-class operator and places him in the position of operating illegally."

In the quarrel with such a system I must join—but somehow I wonder if the organizing of Technicians into a group limited only to this particular license class doesn't, in a way, *encourage* the existance of such a system rather than helping eliminate it!

Some of my colleogues tell me that class-consciousness is an inherent thing in human nature, and is bad only when you're on the bottom class looking up. But I feel that amateur radio is — or at least *should* be — big enough to overcome this problem. One way would be to eliminate all "classes" of licenses and throw all bands open to everyone—maybe with a 10 WPM code requirement as a compromise. Another, as the FCC man in Portland hinted, would be to schuttle the whole blooming thing—and I for one don't want *that* to happen.

What do you think? **K5JKX**

Twoer Change . . . from p. 18

ment of detector coil L6 may be required to "zero" the station with the dial setting.

2. Insert the antenna plug into the new jack.
3. Attach the two-conductor plug to the new 2-conductor jack on the "Twoer."
4. If you have an AC-DC receiver, reread the portion of this article pertaining to AC-DC receiver hookup.
5. Turn on the communications receiver.
6. With the "Twoer" on and with the 6CW4 nuvistor, 6X8 tube and crystal installed in the converter, rotate the new selector switch to the second or middle position. The 6X8 filaments should illuminate. After about 15 seconds for warmup, place the switch in the third or full clockwise position.
7. Tune the communications receiver from 5 to 9 MC for 144-148 MC coverage. The difference should be amazing. You have a more sensitive receiver and more selctivity than you will ever need.

HINTS

A high level rushing noise is *not* a characteristic of this converter. When it is operating properly, you should not even know it is on except when a 2-meter carrier is received. A few "blips" or "birdies" (narrow width carrier-like spots) may be noticed. These are typical of virtually all converters and should present no problems.

If a rushing noise, similar to regen hiss, is encountered, try relocating the leads, especially the antenna lead. It is also barely possible that the converter needs some neutralization adjustment with your particular nuvistor.

In any event, if you think your converter is not operating properly, make certain you have tried it when *known strong signals* are on the air before adjusting any coils.

6-M Rig . . . from p. 13

and soldering it in place. The coils should be mounted under the chassis, located so that they can be tuned from the front panel.

The microphone jack should be located at the opposite end of the chassis from the final to prevent RF feedback. The modulation transformer, T1, can be a low power modulation transformer, or can be made from a discarded push-pull audio output transformer. Either will work fine, so the choice is determined by what is in the junkbox.

The tuning of the rig is easy. The oscillator coil is peaked for maximum output, using a grid-lip meter. The same for the doubler. The final is tuned using a No. 47 pilot as a load. After maximum brigtness is reached, connect a microphone to the modulator. The bulb should increase in brightness when you speak into the mike.

If everything works, it is ready to try on the air. The final is tuned using a grid-dip meter and tuning for maximum output.

The results with 5 watts input are amazing. I have worked better than 1,500 miles with this rig on skip with S9— reports, using a halfwave dipole in my room. The rig is almost TVI-free, meaning that I haven't got any complaints yet. If anybody is interested, maybe I'll write an article about a matching receiver, just as simple, completing an inexpensive station or transceiver.

Letters

Dear VHF:

I recently had occasion to peruse your August issue and was much impressed by its content and layout. The need for a VHF-only publication is evidenced by VHF trends in standard radio publications, and it is strange that a good quality VHF publication has not appeared before. I think your publication will largely fill the gap.

The desire to "roll his own" has always marked the serious VHFers, however, he should continually strive to develop more efficient ways to communicate. The adaption of SSB techniques by so many HF operators in indeed encouraging.

Activity in this city centers mainly on six and two meters; in fact we have one of the most active six meter centers in Canada.

73
Murray Donald, VE4RE
557 Rosedale Ave.
Winnipeg, Manitoba

Murray—

What can we add? We too (obivously) feel that VHF is the frontier. We hope to help extend that frontier in the years to come.

Dear VHF:

I really enjoyed your October issue on antennas. I am wondering if I can obtain a July issue of your magazine. I would also like to see more articles on 432 Mc and up. Keep up the good work.

73
Richard W. Keyser, K6LWE
Downey, Calif.

Richard—

We'd like to see more articles on 432 and up also. Believe you us, they'll be welcomed with open arms!

Dear VHF:

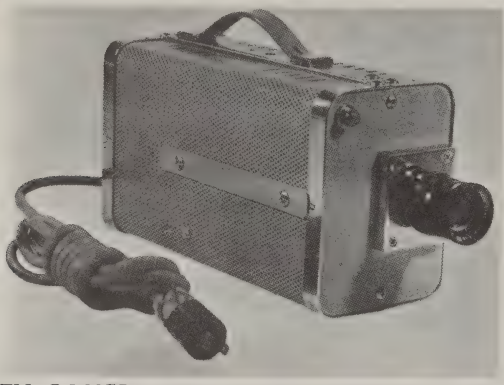
The trouble with most amateur magazines I have read is that they think we are all radio engineers. Frankly, whenever I want something I buy it, not built it. There is a lot of fun to be had in amateur operation without building everything. I am an airline pilot and use this hobby to blow off steam and relax. P.S. How about testing the Clegg Interceptor?

Sincerely
John R. Furtney
Berkeley, Ill.

John—

We'll buck your question to Ed Clegg. What say, W2LOY?

VHF Showcase



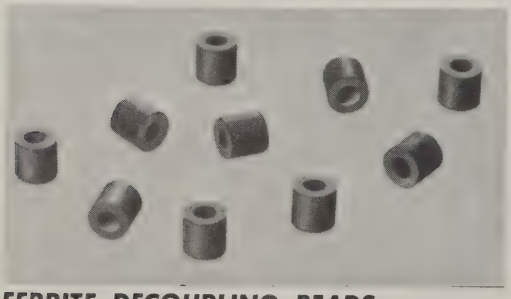
TV CAMERA KIT

For those hardy souls among us who are contemplating ATV, the people at *Craftsman Instrument Labs, Inc.*, 60-30 34th Avenue, Woodside 77, New York, are offering a TV camera kit.

Designated model TCK-1, the kit is complete except for Vidicon tube and lens and sells for $225. Shipping weight is 15 pounds.

The unit uses either WX4303 or 6198 type Vidicon tubes; the WX4303 is available from the maker for $100. Lenses in various sizes are offered at prices ranging from $30.50 to $58.

For complete specifications and data, write the manufacturer.



FERRITE DECOUPLING BEADS

One of the more exciting developments in recent years has been the field of ferrites. Among other things a bead of ferrite on a wire acts as an RF choke a high frequencies, allowing decoupling without the usual string of RF chokes or resistors.

Ferroxcube Corporation of America, Saugerties, N. Y., one of the leading ferrite firms of the nation, has recently announced a line of such beads especially designed for use as chokes.

They claim that use of the beads instead of the conventional RC or LC circuit will tend to reduce the possibilities of parasitics; the beads are available from stock in production quantities at what the maker terms "relatively low cost". Availability of small-lot quantities was not announced.

For further details and data, write the manufacturer.

UNIVERSAL RECEIVER

Hammarlund Manufacturing Company has announced still another general-coverage receiver, which they term a "universal" unit.

It's the model HQ-180XE. This redesigned version of the famed HQ-180 features 11 fixed-frequency crystals in addition to the general-coverage dial, thus allowing instant selection of spot frequencies. Six of the crystals plug in on the front panel and the other five are located inside.

VHF possibilities include spotting of frequently used net frequencies, quick switching to two or three WWV channels, and band-edge marking.

For full specifications and data, write Frank Lester at *Hammarlund*, 53 West 23rd Street, New York 10, N. Y.

GIANT WISH BOOK

A 672-page catalog, crammed full of all types of items of interest to electronics buffs and especially VHF-minded hams, has just been issued by *Allied Radio Corporation*, 100 North Western Avenue, Chicago 80, Ill.

The 1963 version of Allied's catalog sets a record for size; the firm calls it "the most

comprehensive electronics directory in history" and we wouldn't quibble with them.

Included are some 70,000 separate types of devices and products, representing more than 600 manufacturers. Some of these products of interest to us VHFer's include laser crystals ($450 each) and power varactors ($55).

For your copy, drop a line to Allied and ask for catalog no. 630.

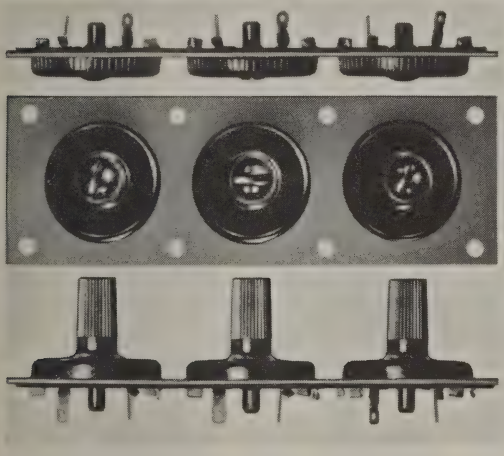
COIL CATALOG, NEW ITEMS

A new catalog for 1963, listing more than 100 new items added to their line, is now available from the *J. W. Miller Company*, 5917 South Main Street, Los Angeles 3, Calif., coil-makers for 39 years.

Among the new items of special interest is a line of *if* transformers especially designed for use with half-lattice crystal filters (part numbers 1725 and 1726) and listing at $3.25 each.

Also of interest is a 3-kC bandwidth 100-kC *if* transformer, for $3.50 (part no. 1710).

Copies of the catalog, no. 63, are available from all Miller dealers. If no dealer is established in your area, write the factory direct. Tell 'em Joe sent you.



MINIATURE POTENTIOMETERS

A new midget potentiometer design which incorporates the resistance element inside the control knob is now available from *Clarostat Mfg. Co., Inc.*, (Dover, N. H.) in a number of configurations.

The maker says the new design, Series 81, is mounted on a strip either singly or in multiples. The pot itself is less than 1/4 inch thick. Resistance range is from 1000 ohms to 5 megohms, linear or tapered. Standard tolerance is plus or minus 20%. Power rating is half a watt.

For full data and specifications, write Clarostat.

HUGHES

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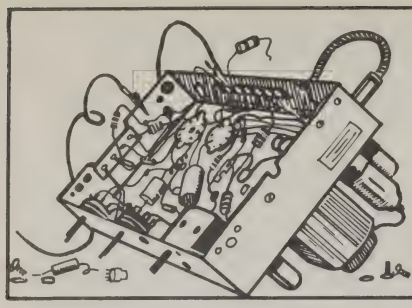


THE CONSTRUCTION BOX

What's Your Tip?

Way back in our first issue, we included this department. Nobody sent in any items for it — and we ran out for a while — so we dropped it.

But last month, a reader wrote and asked that it return. We did a bit of checking around, and it looks as if quite a few more people had missed it but were letting George do their talking.

So here it is back again. This month, all the items are from the VHF staff. But (fair warning) again we've exhausted our immediate stock of little hints and tips. So it's up to the rest of you to share your ideas.

We'll extend your present subscription for 12 extra issues, if your tip is printed. Fair enough?

And since I really expect to be flooded by response to this proposal, don't expect to get a rapid reply on the fate of your "Construction Box" item. When we use it, you'll get the extension! Okay? —K5JKX

Using the 6146 at 2 Meters

Many efforts to use the popular 6146 on 144 Mc end in frustration although this bottle is rated for use as high as 175 Mc.

However, here's one way to assure stable operation of the 6416 on Two: Be sure to strap all four cathode pins to ground with either copper strap (1/2 inch wide, no less) or with the shield braid from RG-58 or RG-59. Hookup wire has too much inductance at this frequency, and bypassing is completely out.

Following this rule, I have never had any trouble with this tube. It should work for you as well. —W5HCX

Silver-plating Small Parts

Silver plating of tank circuits and the like is usually recommended in the upper VHF and UHF regions. However, plating equipment is not usually to be found in the average shack. And the solutions usually used for silver plating are extremely poisonous.

If you have a photographer friend, ask him for his stale hypo solutions. Hypo is a chemical used in photography to dissolve out the unexposed and undeveloped silver, and the only way it gets stale is by getting so much silver in it it can't dissolve any more.

Then polish the part to be plated to a high gloss and drop it in the solution. It will begin to turn black almost immediately. Leave it for 24 hours or more, then take it out, wash it in running water for 15 to 20 minutes, and gently dry it.

The black desposit is silver sulphide, which is almost as good a conductor as silver itself. Frequently, a light polishing will remove the sulphide and reveal a pure silver plating beneath. —K5JKX

Obtaining 4X150, 4X250 Sockets

One of the best power tubes available in the VHF/UHF range is the 4X150 or its bigger brother, the 4X250. The smaller tube is now available from surplus at reasonable cost.

But sockets for these tubes are special items, and often prove expensive.

Here's one way to obtain sockets for them for nothing, provided you have a buddy who works with military or commercial gear which uses these tubes.

Sockets for the 4X lines are usually made by either Eimac or Johnson. The Johnson socket can be recognized by the fact that it has three mounting ears, while the Eimac uses clamps to fix it to the chassis.

To meet military specs, the Johnson type of socket uses beryllium copper for its contact pins. This is an excellent material, with

(Turn to page 38)

Letters

Dear VHF:

Please enter my subscription to VHF HORIZONS for one year. Your ad in QST finally got thru to me. Good luck on your venture. If you want to do something for me, you can line me up with an Oklahoma station on 2 meters who hasn't worked Virginia and would like to try M/S.

73
Samuel L. King, K4EUS
Chester, Virginia

Samuel—

Try associate editor W5HCX. He just put up a 40-element box and runs a KW on 2 meters only. And he's still hunting Virginia.

Dear VHF:

I appreciate your magazine very much. It is just what VHF'ers have always needed in the line of "for VHF'ers only" in a mag.

All in all your magazine has provided me with more useful, down-to-earth info than provided by all the textbooks and handbooks I have ever plodded through. The recent SSB transmitter articles are a welcome change from the 14-Mc mixer type rigs for up-conversion. Keep up the good work.

Sincerely,
Francis R. Wihbey, K1MJC
Waterbury, Conn.

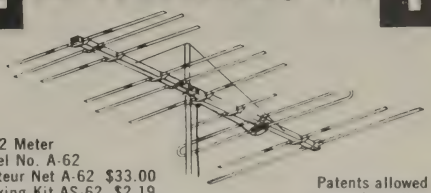
Dear VHF:

Don't worry about the guff from K6VUB (October). He obviously is a cut above most of us and doesn't realize that when a magazine such as yours shows good potential, every new subscription is a boost. He also didn't realize that the VHF Amateur, as such, went to the land of the long fade-out. Tell him not to hold his breath before you give him another shot.

Keep up your how to why to and where to and forget about the tropo opening six months ago" and "I worked ten stations while 2/M mobile down in the subway" and you have a winner.

73
Paul Harcourtt, VE3BDW

2 ANTENNAS IN 1



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Model No. A-62
Amateur Net A-62 $33.00
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Full 4 Elements
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See your FINCO Distributor
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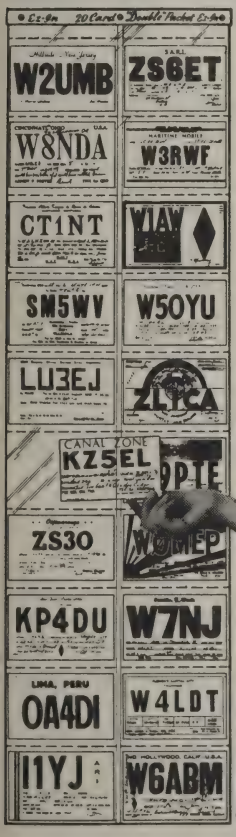
THE FINNEY COMPANY
Dept. V Bedford, Ohio



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HERE'S WHAT THEY SAY:

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"No ham should be without them". Oak Ridge, Tenn.
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"Only way to get the QSL's up without the XYL raising the roof". Newark, N. J.

The unsolicited comments above are on file along with many, many other endorsements

•

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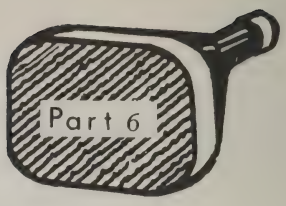
TVHF

by Robert Grimm, . K6RNQ
VHF Western Technical Editor
2800 Monticello Avenue, Oakland, Calif.



MISCELLANEOUS TOPICS

This month we will endeavor to cover a host of miscellaneous subjects that individually would not rate a column.

In one of the earlier chapters I made menton of a ¼ wavelength open end stub that could be attached to the antenna terminals of a TV set to alleviate TVI. This stub was cut from a length of 300 ohm TV type twinlead. I has a rejection bandwidth of a couple hundred kc/s. either side of its center frequency of 50.1 Mc. Undoubedly those operating higher in the six meter band, as well as those operating on 144 Mc, etc., will want to know how to calculate the proper length stub for their operating frequency. The formula for calculating the proper length in inches of a 1/4 wavelength open end stub is:

Length = 2270/F

(Note F is frequency in megacycles.)

If desired a ½ wavelength shorted end stub may be used instead. The formula for calculating the correct length in inches of a ½ wavelength shorted end stub is:

Length = 4540/F

If you are troubled with a particularly bothersome harmonic, one solution may be to use a stub at the antenna terminal of the transmitter. This would be a ¼ wavelength open end stub, cut for the frequency of the offending harmonic. This stub would generally be made from coaxial cable and can be attached to the transmitter by means of a coaxial T connector. The formula for calculating the correct length in inches of this type of stub, made from RG-8/U, or RG-11-U is:

Length = 1850/F

UNUSUAL CAUSE OF TVI!

At one time, I had a particularly troublesome case of TVI that would not respond to the "conventional remedies". It was noted that the complainant's TV set had an "ignition interference" filter connected across the antenna terminals. The purpose of this device was supposedly to reject automobile ignition interference.

However, it also seemed to be pretty good at picking up 6 meter signals, as the TVI was eliminated by removing it from the TV set. This is just one of those little things that make a ham's life interesting.

TVI COMMITTEES

A TVI Committee is comprised of a group of public spirited local amateurs. They are empowered by the FCC to act in their behalf in handling the majority of TVI complaints.

TVI Committees generally have their hands full of TVI complaints, therefore, whenever possible, you should attempt to clear up your TVI complaints on your own. If you have a nasty TVI problem however, or if you just need advice, don't hesitate to call on your local TVI Committee as that is what they are for.

If there is no TVI Committee in your locale your best bet is to contact a fellow amateur and ask his assistance. In requesting the assistance of another amateur it would be wise to select someone who has had some experience with VHF TVI.

The causes and cures of VHF TVI are often quite dissimilar to those experienced by the low frequency operator.

Consequently an amateur whose only TVI experience has been with low frequency transmitters can sometimes (quite unintentionally) send you barking up the wrong tree in trying to correct your VHF TVI. For example: the installation of a low pass filter on your transmitter is not going to help in clearing up the audio rectification in your neighbors "one-eyed monster". I might add that you can always write to this column for assistance with your TVI problems.

LETTERS

DEAR BOB:

"I am interfering with channel 2 on my next door neighbor's TV set. Their TV repairman installed a Bud HF-600 high-pass filter on their set but it didn't do any good. I'm still wiping out their set on channel 2.

"My rig is running 90 watts input to a homebrew pair of 6146's. The antenna is a 3 element beam up 40 feet high.

"I operate on 50.25 Mc so I don't think I'm too high up in the band. Is something wrong with my transmitter? What should I do?"

Sincerely,
J. S., Pennsylvania

Answer:

Your trouble does not appear to be very serious, although you did neglect to mention whether or not you bothered your own TV set. I will have to assume that you don't interfere with your set. I suggest that you have your neighbor's TV man remove the Bud HF-600 filter (it's cutoff frequency is only 45 Mc, so it's not helping out much with your 50 Mc signal) and install a high pass filter with a 52 Mc cutoff. A good replacement might be the Drake 300HP52, although any highpass fliter with a 52 Mc cutoff should take care of your problem. I think this should clear up your neighbor's difficulties.

DEAR BOB:

"I have troubles! A little old lady who lives down the street from us wears a hearing aid. She says she hears me talking on it when I'm on the air.

"This is probably some of that audio rectification that you talked about. But what should I do with a hearing aid? I've fixed this kind of problem with AC/DC radios but I've never worked on a hearing aid and don't know anything about them."

Yours truly,
L. C. L., Calif.

ANSWER:

You can use the same techniques on a hearing aid that you would use on an AC/DC radio. if you feel up to doing the job yourself. However, I would suggest that you have the little old lady take her hearing aid down to the local service organization that services her particular brand.

It would be best if you went along with her so that you can explain to them exactly what the problem is and the usual method of correcting it. By the way, it is not your responsibility to pay for this job.

DEAR ROBERT:

"Some guy down the street keeps complaining that I'm interfering with his TV set, but he won't let me try a highpass filter or a stub on his set. In fact he won't even let me look at his set. He just keeps calling up and telling me to get off the air. He's threatened to call the FCC and to circulate a petition around the neighborhood to get me put off the air and so forth. I'm at my wits end. What should I do in a case like this? I don't bother my own TV set and a couple of the neighbors sets that I came in on were fixed with high pass filters."

Sincerely yours,
J. B., Michigan

ANSWER:

When a TVI complainant refuses to cooperate there is obviously nothing you can do for him. Since you're not bothering "cleaned up" sets in the neighborhood, your transmitter is probably clean, so I don't think you have much to worry about in this department. Even if he does manage to circulate a petition, I wouldn't be concerned because it won't do him any good. The next time he calls up and complains, you might very politely suggest that he does contact the FCC. They will probably straighten him out. You will find that, in matters of this type, the FCC is on your side.

BOB:

"I operate on 6 meters at 50.25. Whenever I come on the air all the neighbors complain that they can't see channel 10. My rig runs a single 2E26 in the final at 25 watts input. The rig is not shielded and doesn't have a low pass filter or anything like that on it, as it is homebrew.

"Is this trouble due to a harmonic or is it blocking?"

Sincerely;
R. P., California

ANSWER:

It sure sounds like you've got a nasty 4th harmonic problem. Why don't you try shielding the rig, as described in last month's column, and install a low pass filter on the rig. Ten to one, this will clear up 90% of your troubles. . . .

FM vs. SSB . . . from p. 10

of carrier and 16.7 watts in each sideband. An SSB station could put all 100 watts into sideband power, giving it a 100/33 advantage over AM without changing bandwidth, and assuming that both upper and lower sidebands contribute to the signal as heard in the receiver. 100/33 is 3-1, or approximately 4.8 db.

The 17 db advantage of CW over AM (without speech limiting) is pretty well accepted. A little arithmetic with the above figures, using CW as a standard, gives SSB a 1.8 db advantage over FM. How conservative can you get?

Scanning the literature

CURRENT MAGAZINES

Frequency Multipication With Power Varactors at U. H. F. Henry H. Cross, W1-OOP. QST, October, 1962, page 60.

In three pages, this article tells you two separate ways (both good) to put about 8 watts on 432 Mc with nothing more than a lower-frequency Communicator, a handful of tank circuits, and one super-special diode.

It's an approach which is completely unfamiliar to most VHF/UHFers—but is a good one. It involves, as the title indicates, the use of a power varactor to either double from a 220-Mc Gonset (operating at 216 Mc) or triple from 144. The multiplier stage requires *no* external power!

When you get enthusiastic about it and check the price of the diode (it nets out at $55 from Allied), you may tend to cool down a bit. But remember, getting the same output any other way will probably cost you more by the time you get the RF tubes, sockets, and power supply—a whole lot more!

Recommendation: Try it!

In the same QST:

The V. H. F. Contest Special, W6GGV. Design philosophy behind a 120-watt 2-meters only station for complete reliability. More details on special units included. 7-1/3 pages of good data.

Position Prediction for the Echo II Satellite, W2YBP. When and where to point antennas to use this one. 2¾ pages.

A Five-Element Two-Meter Beam for $1.50, W1ICP. Beginner's beam but it should work well for anybody. 3 pages.

2-*Meter Moonbounce.* Early report on the K1HMU-W6DNG experiments; for later data see this issue of VHF. 1¼ pages.

In the October 73:

VHF'ing with the Standard Coil Tuner, W4WKM. Billed as the "cheapest really hot VHF converter yet published", this is good if you consider a 6BC5 pentode RF amplifier "really hot" at VHF. It's still a good idea, though. 3½ pages.

50 *Watts on* 50*mc in* 50 *Seconds,* K9STH. How to haywire a DX-20 so it can double in the final. Good way to get electrocuted. 2/3 page.

73 *tries the Irving Preverter,* Staff. They find the same things good about it we did. 5/8 page.

FM Rejecting Stub, W8HOA. How to get rid of FM birdies on six meters, with chart to save you trial-and-error time. Good dope. 3/4 page.

In the October CQ:

A Compact 6 *Meter Transmitter,* Wϕ-WWJ. Standard 12AT7-2E26 modulated with 12AT7-6AQ5 lineup for about 15 watts. What makes it different is that it's all built into a most tiny case. Interesting. 1-2/3 pages.

A Space-Age Radio Amateur — ZE5JJ, W6BAF. Non-technical; this tells about the varied activities of ZE5JJ, the world's only ham who has authority to command a U. S. satellite. Recommended if you want to learn about a real pace-setter. 2¼ pages.

A Simple, Stable 220 *Mc Transmitter,* Kϕ-HEI. Just what the title indicates, and it looks good. Wish we had gotten this one. Read it and build it. 2 pages.

Const. Box. . . from p. 34

one fault — it is extremely brittle.

As a result, the pins occasionally break. When that happens, the socket is termed worthless and is scrapped.

But these sockets are made up of two plastic frames which hold the pins, and three tiny machine screws hold the whole works together. Thus, if you have three of these "worthless" scrap sockets available, plus a little time and patience, you can disassemble all three and make two good ones from the parts.

Where to get the scrap sockets? That's where the buddy comes in! —K5JKX

Pi-Nets . . . from p. 21

Finally, go to the right-hand half of the chart and follow the same procedure to determine value of the output capacitor, again in picofarads.

Note that the input-capacitor value is the *total* input capacitance of the network. This means that it includes the tube's output capacitance as well as any strays caused by wiring. Subtract the tube C *out* from the value you get from the chart; if you dare, also subtract a couple more pf to allow for strays.

Output capacitance readings, likewise, include the input impedance of the coax line. See the August, 1962, VHF Horizons staff report titled "Pi in the Sky" for a full discussion of what this can lead to.

This still leaves us with one chart to go. This one designs the coil for us. Align the desired inductance value in microhenries, on the left scale, with the coil size you intend to use, on the center scale. Read coil length in inches from the right-hand scale and you're done.

The "coil stock" scale in Figure 3 lists Airdux coil numbers; this was done primarily because Airdux numbers are so coded that you can easily read diameter and turns-per-inch from the number itself, as explained in the chart. If you desire, either Airdux or B&W Miniductor stock can be used. To convert the Airdux numbers on the chart to the equivalent B&W numbers, use the following chart:

AIRDUX	B&W	AIRDUX	B&W	AIRDU	B&W
404	3001	508	3006	610	——
406	——	510	——	616	3011
408	3002	516	3007	804	3013
410	——	604	3009	806	——
416	3003	606	——	808	3014
504	3005	608	3010	810	——
506	——				

Letters

Dear VHF:.

Thanks for a VHF mag (yep, I subscribed!). Keep us posted. And how about some info on 6-meter ground wave. Back east they work quite a ways. One old-timer here who has been on 6 for years with 100 watts has never worked Okla. or even Kansas City Mo. What gives?

Sincerely,
W. G. Erlich, K0VQK
2607 E. 13th
Wichita, Kansas

Bill—

That question puzzles us a it too. One thing for sure, the ground conductivity plays a large part in it. For instance, the Oklahoma City-Tulsa path is much poorer than a same-distance path toward Sherman, Texas, from here! We're looking into it quite deeply; if we ever find any answers, you can expect a "staff report" on the subject. But we have it fine hereabouts, compared to California—there, 60 to 70 miles is DX for a 100-watt station!

Dear VHF:

Thank you for your confirmation of our advertisement in VHF Horizons. I appreciate your offer of reciprocation and certainly would like to encourage this, however I feel a duty to the readers of 73 and would like to have some sort of assurance that VHF Horizons will be continuing publication.

I am not yet convinced that there is an adequate number of amateurs interested enough in reading VHF news to support such a specialized magazine. This may seem strange coming from such a strong VHF proponent as myself with the most elaborate VHF installation in New Hampshire . . . but it is an opinion that has resulted from many years of VHF operation and magazine editing in the field.

The lack of advertising results in VHF Horizons and the rapid degeneration of your initial stock of articles would seem to back this up.

In our early months we made the mistake of accepting advertising from another ham publication. They went out of business six months later and left us with some very angry readers who thought that we should have been more careful. I can't help but agree with them.

Wayne Green, W2NSD/1
Peterborough N. H.

Wayne—

Thanks for the compliments. Note the bylines in this and following issues to see how our stock of articles is "degenerating." Guess we'll have to stick to brand Y.

CLASSIFIED

Commercial classified advertising space is available at 25 cents per word, per month. Minimum number of words per advertisement, 10. Classified advertising submitted by individual hams which in the opinion of VHF Horizons is non-commercial in nature, 10 cents per word, no minimum. Full remittance must accompany all orders; closing date for each issue is the 5th of the preceding month. Copy must reach Oklahoma City by that time.

6M RIG, Comm III, Mic., M.M. bumper mount, 60" whip, coax and connectors, spare 2E-26's. Excellent condition. Best offer over $150. Bud Wall, K6JWF, 180 W. Loop, Camarillo, Calif.

FOR SALE: Geloso 2-meter VFO transmitter, $35. National 6M converter, $20. Filter King conv. $25. CE 20A es MM1 scope. 75 meter Swan. Make offer. K9EID, Bob Heil, 402 Border Street, Marissa, Illinois.

FREE SAMPLES & CATALOG. QSL CARDS. $2.50 per 100 in 3 colors. Garth Printing Company, Box 51V, Jutland, N. J.

TV CAMERA — Low Cost — Schematics, instructions 50c. Denson Electronics, Rockville, Conn.

73 MAGAZINE — Third year with more feature articles than any two other ham magazines. $3.50 year. 73, Peterborough 4, N. H.

QSL's FOR LIVE HAMS!! Samples 10c refundable. Harms, 905 Fernald, Edgewater, Florida.

D.C. PULSES

Those of us who have struggled with the problems of keeping an accurate log while mobiling down an expressway at 60 MPH and talking in a 10-station round-table (and who hasn't?) may find the situation a bit simpler if a rule change proposed this month is accepted by the FCC.

The petition for rule-making, filed by Jack W. Bazhaw, W5CXJ, of Dallas, Texas, requests amendment of Section 12.136 of FCC Rules and Regulations, to eliminate the need for VHF/UHF mobile operators to maintain a log.

Proposed wording of the log rule as spelled out in the petition is:

"Each licensee of an amateur station *except mobile stations operating on frequencies above* 50 *Mc/s* shall keep an accurate log of station operation . . ." (Italics indicate the proposed change.)

Among the supporting arguments, Bazhaw listed the fact that "almost no other radio service requires the keeping of logs by mobile stations." He specifically pointed out that Public Safety, Industrial, and CB mobile stations are not required to log their activities.

Another of his supporting arguments is that most mobile operation is in contact with one or more fixed stations, and that all pertinent data would thus be recorded in the logs of these fixed stations.

"Since mobile operation on frequencies above 50 Mc/s is local in nature any log information needed by the Commission for enforcement purposes could be obtained from the logs of the fixed stations involved, their identity readily provided by the mobile station operator," Bazhaw wrote.

The Texas ham also pointed to the traffic hazard created by attempts to log operation "in dense traffic, on high-speed expressways, and darkened streets at night." He said "Some of these conditions or a combination of them preclude the operator from stopping his vehicle to make the required entries. Making log entries while in motion is a prohibitively dangerous procedure."

The petition was filed on October 8; FCC file number is RM-371. At press-time, no action by the Commission had been reported. Comments have *not* yet been asked; none should be filed until the FCC invites them.

Letters

Dear VHF:

Naughty naughty, naughty! Page 3 of your September issue, midway down the right-hand column "Of course it should have **head** 1296". Of all places for a typographical error is when you are explaining away the same.

73
George V. Kedrowsky, WA2PGY
16 Brockton Court
Metuchen, New Jersey

George—
We missed it. We'll probably miss more. Oh well.

Dear VHF:

Inclosed you will find a blank subscription card out of your "VHF HORIZONS". This could have been a subscription for the "VHF HORIZONS" but after reading the July, August September issues we found out that you are not for the Technician class VHF op, but just on top of the fence. We at first thought you were for the Technician and the Technicians would be for the "VHF HORIZONS". Glad I found about it before I sent in for the subscription.

73
Bernie Ellis, K4PUD
408 Lilliston Avenue
Colonial Heights, Va.

Bernie—

It's probably best that you didn't subscribe since you feel this way. We don't deal in emotionalism — just in amateur radio above 50 Mc. We couldn't care less what "class" of license anyone holds so long as he is a true amateur radio operator — one who loves radio! As a matter of fact it might not be a bad idea to abolish all "classes" of license and go back to the old days — if it could get rid of the oppressed-minority and class-consciousness that now festers in our VHF bands.

First Washington-to-South Dakota 2-Meter Contact

The first two-meter contact between Washington state and South Dakota that we know of was made October 21 between W7LHL and WϕENC.

W7LHL reports the contact was made during a three-day sked, October 19 through 21 at 0430 to 0530 PST.

Third day, writes Ernie, "received 28 seconds of WϕENC first 30 seconds. I almost fell off of the chair. About 0457 received 13 seconds of S3 and R."

COMING IN THE JANUARY VHF . . .

January comes in December in VHF land. Like around Christmas day, when VHF will arrive in your mailbox. The winter E skip season will be upon us, for six meters, and the January League VHF contest will be just around the corner. We may even be having some minor auroras. Down along the Gulf, the six meter boys should be working South America now and then. But you, snuggled tightly in your VHF shack will be reading about the following, in the January 1963 VHF Horizons!

A DEEP LOOK AT THE CASCODE CIRCUIT

The well-known and justly famous cascode circuit does have some disadvantages as well as some tricky points. Our staff report takes a look in depth at this popular low-noise RF amplifier.

432 Mc WITH HAMMER AND VISE

The 432-Mc band is gaining in popularity rapidly. K6HCP tells you how to put maximum legal power on the band in a hurry, provided only that you have some 144-Mc drive available and a 4X250.

SPORADIC-E REPORT—A COMPARISON

Many 6-meter ops feel that the last two years have been "record" years for sporadic-E openings. K6RNQ has prepared a daily comparison of 1961 with 1962, showing all openings to the West Coast for both years. Should be handy to help predict the '63 season.

YOU CAN MEASURE NOISE FIGURE WITH ACCURACY

One of the foggiest subjects in VHF reception, for some time, has been "how to measure noise figure accurately". W4LTV tells how to build a calibrated noise generator, and how to use it.

CONTEST OPERATION

January contest time is approaching. Former winner WØKMV tells what happened to him a couple of seasons back. You may not learn many trade secrets, but you'll probably share his feeling!

TWO-METER SPORADIC-E PROPAGATION?

It's not too early to make plans for taking advantage of this controversial medium to get a couple more states next year—if it exists! Some how to, where to, and why on the subject.

AND MUCH, MUCH MORE

All the regular departments, including TVI-VHF, the operating and DX news, the Construction Box, and a couple of features we don't want to talk about yet . . . All will be here in the January VHF!

Place
Stamp
Here

TO:

From a VHF Horizons Reader!

HELP!

We still need the call letters of VHF hams heard locally in your area. If you don't take a few minutes to send us their calls, how are we going to know they are on VHF-UHF, and send them a sample free copy of this magazine? Think of what a wonderful Christmas present that would be. A sample copy of VHF Horizons! So sit down now, while the band is quiet and the winter winds are blowing, and give us a few dozen VHF calls you hear locally on the band. And mail this to us. TNX!

ANNOUNCEMENT

You fellows have been doing such a great job promoting VHF Horizons with advertisers we sure don't want to slow down. So how about filling out the perforated card below and dropping it into the mailbox. Pick one of the manufacturers listed with address, and he'll soon get the word about advertising in VHF!

Send Card to:

Terry, W9DIA
Amateur Electronics Supply
3832 Lisbon Avenue
Milwaukee, Wisconsin

R. Freeland,
International Crystal Mfg. Co.
18 North Lee
Oklahoma City, Oklahoma

Art Taylor,
E. F. Johnson Company
Waseca, Minnesota

Dear OM:

I can't think of a better way to start the new year than putting your advertising support behind VHF Horizons Magazine. 19,000 VHF'ers like me are reading this book this month. If your products were advertised here, we sure would buy 'em! How about it?

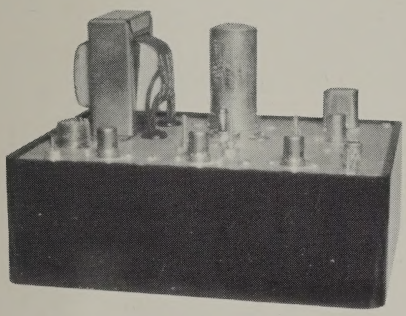
73

---------- Call

UNDER 3.0 DB NOISE FIGURE!

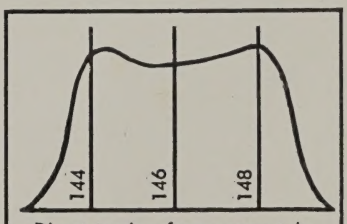
ONLY **$54.95**

Give Your 144 mc Station Space Age Specs!



Here is the **first complete** two-meter converter package designed to meet the exacting requirements of the space-age. Front end noise figure of better than 3.0 db. Two 6CW4's in neutralized cascode circuit. Four 6CW4 Nuvistors for maximum reliability, gain, performance. Four tuned circuits at 144 mc plus neutralizing circuit. Built in power supply.

No matter what your 144 megacycle interest, here is the converter for you. Designed to give uniform high gain-low noise response across the entire two meter band. This converter is designed for DX work, whether it's tropospheric bending for Oscar 3. Yet it will NOT overload! Careful shielding eleminates stray coupling. Precision construction and design throughout. Six months guarantee on all parts except Nuvistors.



Direct tracing from scope tube face shows uniform response curve of the Parks 144 mc converter.

Put this Parks 144 megacycle converter to work for you in your VHF ham shack today! Order direct from the factory. Pick your i.f. range from the following: 7-11 mc, 14-18 mc, 26-30 mc, 27-31 mc, 30.5-34.5 mc. Only **$54.95 each,** including postage and insurance. All nuvistors, complete and ready to plug into your system! Send certified check, cashier's check or money order.

ALSO AVAILABLE for immediate shipment, the Parks Six Meter Scatter Special converter (same i.f. ranges available) designed to get way down into the 50 megacycle antenna noise and really pull out those weak DX signals. Identical to the 144 model, in all quality features. Price? Unbelievably low at $34.50! Looking for a quality-built code wheel for DX and scatter? A Parks code wheel is in use at W5KHT for scatter tests (see November issue of VHF). Price - just $25.00 each. Allow ten days for shipment. BRAND NEW - Low cost, quality two meter and six meter Nuvistor pre-amplifiers! Write for full details!

ORDER TODAY . . . DIRECT FROM:

PARKS ELECTRONICS LABORATORIES

ROUTE 2, BOX 35 — BEAVERTON, OREGON

WELL?

VHF Horizons has slashed display advertising space rates to 51% across the board!

Call collect today for full details.

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